

Landscape Ecological Planning and its Solutions in Latvia

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Abstract – The article deals with the findings in the landscape ecological planning and the approbation of its methods at mosaic pattern landscapes in Latvia, i.e., an interchange of agricultural and forests lands. The research is based both on reviews taken from scientific literature and on a spatial data analysis, using geographical information systems and field research. Although this approach of the landscape ecological planning and its solutions are used comparatively rarely, in modern society, however, they must be used when planning various levels of authorities and branches of agriculture, forestry, transport etc. This article highlights essential problems of landscape ecological planning in Latvia, first, planning approach and practice, second, spatial data, third, normative laws and regulations.

Keywords – biological diversity, cultural landscape, landscape ecological planning, landscape ecology, planning in Latvia.

I. INTRODUCTION

Starting from the middle of the 20th century landscape ecology was acknowledged as a branch of science, so it developed rapidly and its role in practical planning was considerably increasing. Nowadays, in order to create a plan how to develop a new territory, the emphasis is laid on the way to satisfy the human needs. In the process of planning, not sufficient attention is paid to ecological problems [1]. As a successful elaboration of short term or long term planning is not feasible unless ecological problems are integrated in it [2], thus, to provide for sustainable territorial development, more and more frequently the landscape ecological planning (LEP) occurs or ecological principles in spatial planning are introduced. During the last two centuries on a global scale ever increasing landscape changes have affected landscape functionality, biological diversity, ecological stability and cultural landscape patterns [3]. Also in Latvia diverse landscape transformation processes are becoming more and more topical, for example, the overgrowing of agricultural lands, intensive forest fragmentation and construction work in valuable landscapes. Consequently, because of ever increasing changes in landscapes, a strong emphasis is laid on more severe global environmental protection issues. A broad list of measures should be born in mind to provide for successful long term territorial development. In the process of the LEP, the ecological landscape principles and factors should be borne in mind to implement the LEP approach, and should be scientifically applied to secure a universal and long term success of this document.

The LEP is a comparatively new branch of science and this is the reason why various ideas, theories and essentially diverse conceptions about its targets and significance are

expressed. The LEP encompasses the planning of land-use and management that is based on the biotic, abiotic, cultural and historic, social and economic factors in the territorial development, because they provide the development of a particular territory preserving its biological diversity and cultural landscapes [4].

The fundamentals of the LEP are based on the approach which is aimed at the maintenance of viable species populations in a long term perspective which is frequently a much more difficult challenge than a short term protection of species and biotopes. This approach must, first, provide for the preservation of biological diversity, second, the protection of a cultural and historic landscape and its components, and third, the protection of aesthetic value of landscapes simultaneously furthering a sustainable development of areas and regions [4]. However, the approach to the LEP used in North America determines that the LEP is an instrument that integrates the exploitation of resources with biological sustainability considering the processes and transformations in nature varying on the scale of time and space.

In spatial planning, a worldwide approach based on landscape research has been applied already for several decades. In most countries various types of methods for the landscape ecological planning have been elaborated and used. Undoubtedly they do not contradict each other. Their distinction mostly lies in the characteristic diversity of their territorial landscape and a large variety of ecosystem scaling which have been applied [5]. The main targets of LEP have been to provide preservation of biological diversity [6], ecological sustainability [7], forest management activities [8] or proposals for ecologically optimized spatial organizations and functional land use. Suitable LEP for a number of landscape types, such as wetlands [9], forestry areas [10], [11] and urban areas [12] have been created.

In the field of landscape ecology, until now, great attention has been paid to landscape pattern and landscape metrics. However, quite frequently further actions of the process, such as drawing guidelines, presenting practical recommendations for landscape management etc. are not indicated. The above mentioned aspects are characteristic in the countries where human altered landscapes dominate and it is considered essential to restore or conserve natural landscapes [13].

The aim of this investigation is to study a landscape ecological planning and to improve its practical solutions in Latvia. In this article the authors have summarized, first, information taken from the studies of scientific literature, second, described the experience on elaborating the LEP in Latvia, third, performed research work on landscape

management and fourth, made cognitions and conclusions. In the result and discussion chapter the principal findings of the research have been discussed and analysed. The authors hold the opinion that the obtained results provide for their wide usage in landscape management, in nature protection planning, as well as in the strategic development of agriculture and forestry, and spatial planning.

II. MATERIALS AND METHODS

The research on the solutions of the LEP is based, first, on the review of scientific literature, second, on the analysis of spatial data in planning areas, which include field investigation, too. Due to the abundance of data and in order to provide their interoperability, geographical information systems (GIS) were widely used.

The sampling territories are located in the North and Southeast of Latvia. They form particularly protected nature territories with a different status i.e., the North Vidzeme (region) Biosphere Reserve (founded in 1997) and the Razna (lake) National Park (founded in 2007), and they cover an area of 4576 sq.km and 596 sq.km respectively (Figure 1). Sampling territories were chosen in accordance with the principle that for these territories the LEP was duly elaborated. In these territories diverse types of landscapes could be found, for example, landscapes of agricultural lands, landscapes of large forest tracts, wetlands, lake districts and mosaic pattern landscapes that have been gradually developed through the interaction between humans and nature. The landscape structure and its resolution are the main distinctions characterizing these territories.



Fig. 1. Location of North Vidzeme Biosphere Reserve and Razna National Park.

In order to give an assessment to the urgency of landscape management and practical usage in Latvia, within the course of the research, expanded interviews from the professionals were taken with the aim to clarify their viewpoint about their previous experience in landscape protection and planning, about the urgency of these activities as well as how to improve landscape management in Latvia. In compliance with the target the following questions were asked:

- *What implements in landscape management are existing at present?*

- *Which way are they applied in Latvia?*
- *What priorities should be granted to the landscape management problems in various land management and planning documents?*
- *What activities have to be brought forward in order to perfect landscape management protection and planning methods in Latvia? Which is the most urgent activity that has to be undertaken first?*
- *Is there any need to elaborate the landscape ecological planning approach in Latvia? In which cases would it be preferable?*
- *How is it feasible to put into practice the landscape ecological plans, observations or various with the landscape protection related aspects?*

In total, 27 experts from different interest groups were interviewed including scientists, representatives of municipalities, representatives of nature protection and environmental institutions, nongovernmental organizations, as well as farmers and forestry managers. The responses in the course of an interview were taken down. After each interview was finished, it was repeatedly analyzed. The interviewer made a summarization in the database compiled for interviews that was subsequently used in data analysis. In addition, all normative laws and regulations related to landscape management were studied and analyzed.

This article gives a summary of the methodological approach used in North Vidzeme Biosphere Reserve and Razna National Park as well as the obtained conclusions and findings were applied in further research work. When the LEP is created, parallel the biotic, abiotic, socioeconomic factors and cultural heritage values are also included. The methodology for the LEP is taken the approach from "Forest Analysis and the Methodology Design [14]. This planning methodology is mastered and introduced into Latvia by *Simon Bell* and *Olgerts Nikodemus* [15], elaborating the LEP for local authorities in Taurene.

The process of LEP in Latvia includes several stages such as analysis of landscape pattern, the landscape biological, aesthetical, cultural and historic, and economic values their definitions and valuable landscape categorization, the landscape alternations flow analysis and its green-network planning, the dynamics analysis of a landscape, the opportunity and limitation analysis, the development of various scenarios, the desired landscape construction, the creation of the Landscape ecological plan and guidelines for its implementation.

III. RESULTS

C. Topicality of Landscape ecological planning

The studies of scientific literature reveal the fact that the LEP is rarely created in territories with dominance of a mosaic pattern landscape the structure of which in the course of years has developed in an interaction between humans and nature. The landscape structures in Latvia are shaped in the 20th century [16], [17], but nowadays their transformations are still

essential mainly because of considerable polarization and marginalization processes [18], [17]. The transformations of landscape structures including overgrowing of agricultural lands and forest fragmentation have significantly affected the biological diversity of landscapes [19]. Within the context of this research, it is essential to mention, that mosaic pattern landscapes are not similar to typical Western Europe landscapes in which the functional land users compete with each other because of the restricted space of land [12]. For this reason the approach to the LEP in Western Europe could be partially suitable also for the Northern Europe countries.

Also the studies of scientific literature proved that in landscape ecology until now great attention has been paid to landscape characterization, but quite frequently succeeding actions such as elaboration of guidelines, practical recommendations in landscape management etc. [13] are not indicated.

D. Results of interviews

The interviews taken from specialists of various branches of agriculture, science, foreign institutions etc. proved that the LEP or the use of its principles is extremely topical. The majority of interviewees except two persons knew that the LEP is used in Latvia. These interviews confirmed that accessible tools for landscape management in Latvia are used quite rarely or are not used at all. But the interviewees acknowledged that spatial planning is the most significant tool in order to organize protection of landscapes or provide their desirable development. As other important tools were mentioned the nature protection plans, the rural strategic plan and subsequent subsidiary payments for it were mentioned as being of minor importance. Almost all interviewees admitted that in Latvia there is no sufficient database for normative laws and regulations in landscape protection. Also the majority of the interviewees acknowledged that landscape management must be of first priority, the role of landscape protection in the planning process must be considerably raised, and the practice of the LEP must be introduced into Latvia. As to the possibilities how to change the existing situation, the opinions varied, though the majority of the interviewees stated that at present, the study of the existing situation, methodological materials and also good practises examples of planning are missing in Latvia. But several interviewees held the opinion that it is essential to improve the database of normative acts and regulations. The majority of the interviewees admitted that the LEP approach should be introduced into the whole territory of Latvia primarily formulating the national basic guidelines as well as giving an assessment of landscapes at least at the level of the regional planning. On the other hand, for the landscapes of the highest value it is urgent to adopt detailed regulations for planning at the level of local authorities. In this respect also the two most effective solutions how to introduce the LEP principles, i.e., first by planning the catchments area, and second, by passing the law on land management were mentioned. When assessing the existing landscape management it was indicated that the previous collaboration among various institutions, which are

subject to the Ministries of the Environmental and Regional Development, Agriculture and various institutions, was assessed as negative. For example, as several interviewees remarked thus the Ministry of Environment had once dealt only with particularly protected nature territories or habitats and species, not paying attention to the quality of ecosystems or the functional significance of a landscape. Moreover, the Ministry of Agriculture and Government affairs are reproached, first, to have too much relied only on economics and second, to have neglected problems connected with landscape management.

E. Implementation of Landscape ecological planning process

In the LEP process, primarily the analysis of the landscape structure, which reflects the abiotic, ecologic and socioeconomic factors of a landscape, is performed. In Latvia, owing to the complex mosaic pattern of landscapes, it is feasible to select matrix, patches, corridors and small landscape elements using the scale 1:25 000. When performing mapping of landscapes, on a smaller scale, it is faceable to divide these landscapes following the dominating pattern or a complex of matrices and not drawing separated landscape patches. The structural analysis of a landscape encompasses also the assessment of its dynamics. For Latvia, this type of data analysis reveals the rapid transformations within a landscape. Thus, considering the obtained data, in the Razna National park within the course of the 20th century the territorial area of forests has expanded more than double. As a result, in Latvia, similar to other North European countries [7] essentially different trends in the landscape transformational processes are observed. However, it should be remarked that when analyzing data, which differ in time, it is essential to be aware of their initial preparatory scale and target.

The estimation of the existing and potential territorial biodiversity in approach of the LEP, is based on the territories which are more fitted for species and biotopes rather than on definite distribution of species and biotopes.

The biologically significant selection of landscapes lies in the statement that providing for the activities of biodiversity protection at the landscape level, it is not feasible to take one optimal solution that would fit all species because each of them has specific requirements. It is preferable to select the species who indicated landscape scale of which corresponds or is close to the planning scale. So, several landscape structures and their biodiversity characterized by indicator species of mammals, birds, fishes and invertebrates as well as types of separate plant communities and biotopes were selected. As defined by experts the environmental conditions in order to fit each indicator, and using the GIS and various spatial data, such as the database of forest inventory, the hydrologic information, the available data on the distribution of one or other species, landscape elements that are significant for biodiversity were selected. The use of this method in the conditions existing in Latvia prefers an optimal solution because in the situations when information about the distribution of species and the ecological significance of territories frequently is quite scarce, this approach provides

information both about existing and potential ecological niches of species. The investigations reveal, that existing spatial distribution of landscapes and its elements in planning areas supports ecologically sufficient structure of landscape nowadays as well as in near future. However to maintain biological diversity in longterm, special care must be dedicted for maintaining quality of certain elements of landscape, such as – age structure of forests, spatial distribution of grasslands.

The visual, cultural and historic value of a landscape is a significant landscape resource that provides also the socioeconomic development of rural territories. The most significant criteria in order to give an assessment to the visual value of landscapes are, first, the quality of a landscape, second, the visibility of a landscape, and third, the accessibility to a landscape [15]. As most frequently a landscape is associated with definite scenery or its visual image, the assessment of the visual value of a landscape nowadays is of great importance, but at the same time it is subjective because it is based on several experts viewpoint. However, when relying on the GIS it is feasible to model the visibility of a landscape thus essentially diminishing the subjective approach in the assessment process. The use of this approach enables to access the visibility of landscapes not only nowadays but also in former days. For example, the visibility modelling performed in the Razna National park testifies that nowadays the range of scenery to the lakes that are typical of the Latgale Upland has considerably narrowed. In order to give an assessment to the cultural and historic value of a landscape, first, the history of the landscape or its elements must be studied, and second, the existing situation must be evaluated.

When elaborating the LEP, to characterize the landscape structure, also various socioeconomic indicators are used. Most frequently they are various indicators obtained from national economy and demography which refer to the land use [18] and which are provided by local governments, i.e., the dynamics of the number of population, the number and location of guesthouses, the total number of cattle per hectare, industrial fishing in lakes and other indicators.

All stages of landscape assessment and analysis are aimed at the definition of the preferable landscape structure. The definition encompasses characteristic features of a landscape regarded as desired considering all the preconditions of landscape development as described before. To construct a preferable landscape, its significant component is the elaboration of a landscape scenario, which clearly reveals the probable direction of landscape development and identifies the potential problems. At the concluding stage of the LEP, the options how to implement the preferable landscape structure and restrictions, are analysed. The analysis is required in order to assess the options of the preferable condition of a landscape. From the very beginning, when starting to define the total landscape values, a significant role in the LEP process is played not only by involving the professionals but also the interested stakeholders (Figure 2). In the LEP process interest groups from various layers of society, such as

representatives from nature protection organizations and local authorities, nongovernmental organizations, farmers, forest managers are involved. As the existing LEP experience in Latvia testifies that its population does not take an active part in the planning process. The innovative status of the LEP approach in Latvia, the planning scale and the recommending character of the LEP could explain it. Similarly as most frequently the major target of the LEP is aimed at providing for the ecological stability and desired conditions, then it is popular with the local inhabitants and interested stakeholders to associate this LEP with nature protection activities to which the reaction is very often negative. As the existing LEP experience in the Northern Vidzeme Biosphere Reserve proves that useful information can be obtained by enquiring the local inhabitants. For example they all, with the exception of one person, admit that in Northern Vidzeme they have observed negative transformations in landscape caused by human commercial activity or inactivity. The inhabitants also admit that the landscape is mostly affected by cutting down the trees (44%) and abandonment of land (40%).

At present the introduction of terms for landscape protection and development in Latvia can be fulfilled by planning of territorial and nature protection, because the existing legislation does not provide for this special approach. In the analysis of restrictions and benefits, therefore, the territorial planning at various levels and nature protection plans must be assessed. In addition also the data connected with agricultural land and woodland was analyzed. For example, when analyzing the database of forest stands, the activity of forest management, both in space and time, is assessed. Spatial analysis reveals the high level of forest fragmentation caused by intensive forest works especially at a period from 2002 to 2005 in Razna National park. Such increase is caused by the forest owners' anxiety about the foundation of a particularly protective nature territory and potential restrictions in it. On the other hand, the spatial data analysis on support payments in agriculture within the period of five years reveals the territories with a high transformational risk in future. The LEP and its research have proved that a significant role in the landscape transformational intensity and direction similar to other countries is played by the Europe Union agrarian policy [20]. However, when the subsidiary payments were analysed, conclusions were made that for their management, the available options of support payments are used only partially. For example, by applying remote sensing methods in the planning process, the prospective natural meadows amounted to 10 percent of the total area but at present in this territory only 0.3 percent of biologically valuable grassland are being managed. Given examples demonstrates consequences of our decisions and possibilities of actions in landscape management.

The analysis of territorial plans in planning areas proved that, if passing over to a lower planning level, that is, planning at a regional-local authority level, the landscape protection and development conditions in these lower level planning

documents are gradually decreasing or even totally disappearing.

The development of scenarios is unused tool till nowadays at spatial planning in Latvia. Defining of scenarios and its modelling demonstrate effective solutions in LEP process. For instance the development of scenarios and comparison of its spatial models point out that within next 15 years changes in landscape structure can cause significant impacts on economic and biological diversity. Therefore to reduce negative impacts it is necessary to use scenarios modelling approach in planning systems connected to landscape management. It supports with necessary solutions for defining priorities for development of certain land use forms.

In order to provide for the preferable structure and functionality at the conclusion of the planning process, the ecological plan of a landscape has been elaborated. As the legislation of Latvia does not provide for the LEP, therefore, within the planning process, additional guidelines are created to introduce this plan. The LEP encompasses suggestions both for planning the territories by local authorities and for the nature protection plan of a particularly protective nature territory as well as for the forest management plans.

At present the situation in Latvia is similar to other European countries, where an intensive exploitation of nature

resources, such as forest fragmentation, intensification of agriculture, mining of mineral resources, construction work in scenery sensitive territories, has lasted for a long time and is still going on, on the one hand, as well as abandoning of fertile territories on the other. Therefore the transformational processes become more intensified in a landscape and cause disapproval among the interest groups. Because of this factor, solutions must be sought in landscape management that are mostly related to land use planning.

The core problems that the handle author of this article have to deal with in the landscape ecological planning process are, first, data availability and their compliance with the selected scale, second, the legal status of the LEP, third, the definition of preferable landscape structures, fourth, the inactivity of local inhabitants.

The process of elaborating the LEP and its findings offer significant information about the explored territory. Exactly the multifarious approach can be considered as a decisive factor that particularly intensifies the urgency for the LEP approach and the significance of the findings, which is also proved by the interviews taken from the specialists in the course of the research work.

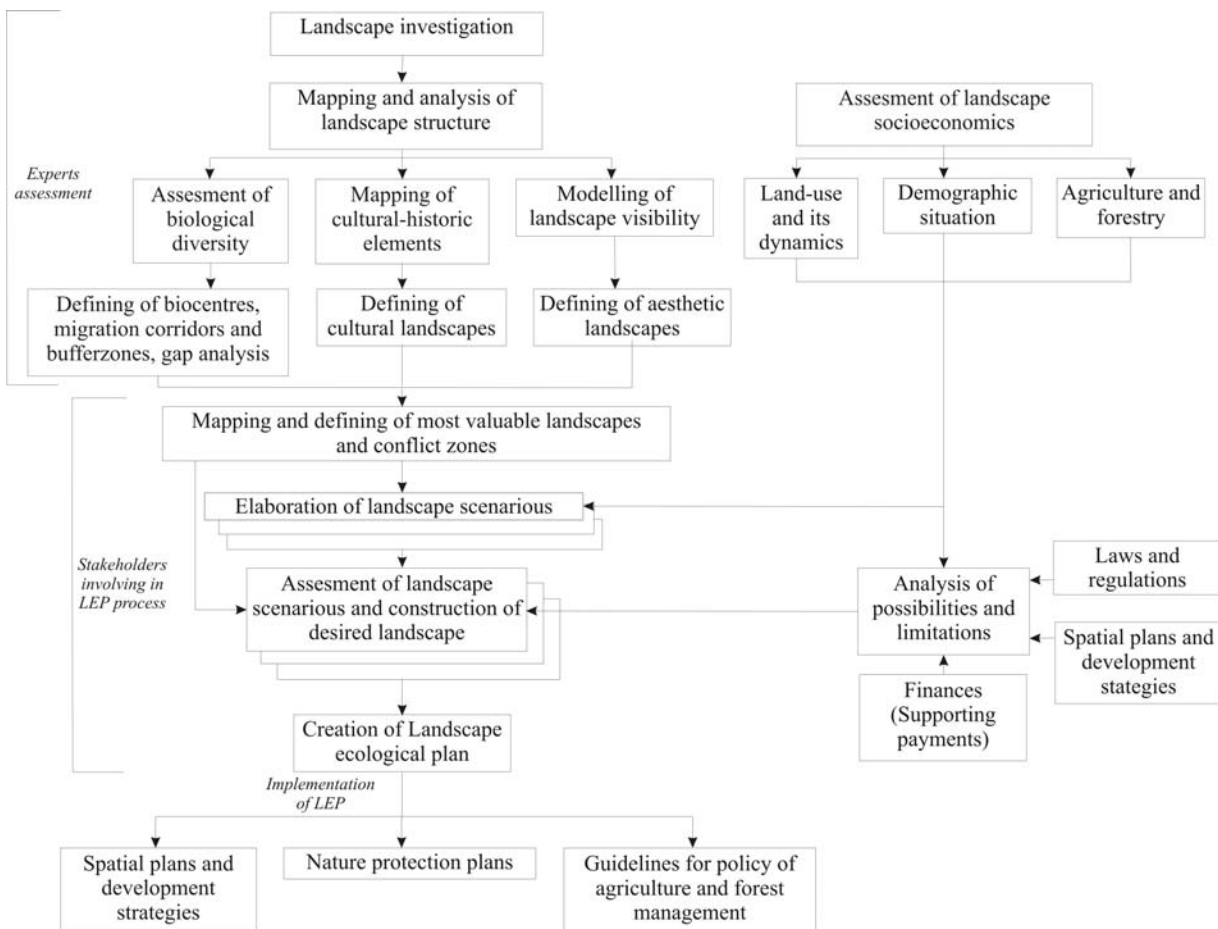


Fig. 1. The improved process of LEP includes several stages that predict more detailed planning approach. It showed linkages between several stages, involved stakeholders and role of them in planning process. Similarly this scheme emphasizes implementation of LEP approach and results.

As nowadays to protect biologically valuable species, a special attention is paid to their habitats and biotopes, at the same time not sufficiently analyzing species feeding and abiotic aspects [6], [21] the biological assessment performed in the LEP process revealed the functional link among the territories and the existing problems. On the whole the mosaic pattern structure is fitted to the expansion of diverse species, but quite frequently the problems in the landscape functionality are caused by the quality of its separate components, for example, the shortage of old forest stands and rapid overgrowing of meadow patches. Therefore, when planning the territorial management, these shortcomings must be diminished or eliminated.

By performing an all-round analysis of a landscape, quite frequently a discrepancy between the visual and ecological values of a landscape as well as between its preservation and management is formed [22]. Also the visual and aesthetic value of a landscape is closely dependent on the way that agricultural land is cultivated and what the anthropogenic load on the neighbouring lakes is like [4]. This dependence was also proved by elaborating the landscape ecological plan, for in most cases economically significant territories coincided with visually high-quality landscape territories. But, when overlapping the whole spatial data it appeared that these economically significant territories mostly refer to lake districts and also overlap with ecologically significant landscape territories. For that reason, it is essential to elaborate the territorial planning and in addition it must be done using a most highly integrated approach encompassing various landscape factors [23, 24]. Similar to the territories of high quality landscapes abroad, the rapid changes of the last years in mosaic pattern landscapes that are typical of Latvia have lowered the traditional understanding of a landscape with the population. That is why one of the most difficult stages in the elaboration process of the landscape ecological plan was attempts to give the definition of the preferable landscape. Theoretically, the definition of the preferable landscape should correspond with the viewpoints of all stakeholders, but practically it is not feasible to obtain this condition of landscape because of the lack of one common target [25]. In case the interests of two groups contradicted each other, the priority was given to ecological interests. The biggest problem in preserving the mosaic pattern landscapes is how to provide for the vital capacity of farmsteads and for land management simultaneously providing the resources needed for their existence and functionality, raising the landscape to a functional level which offers economic benefit for the local population and recreation options for the tourists [26].

IV. CONCLUSIONS

Within the framework of the research, the methodology of the LEP and its solutions in compliance with its conditions in Latvia, have been improved. First, the analysis and the specification have repeatedly been performed to the solutions fitted for the mosaic shaped structures in such LEP stages as the structural analysis, the usage of socioeconomic parameters

and biological diversity indicators. Second, in comparison with previously used approaches, this one additionally encompasses all – embracing data analysis, public involvement and defining development scenarios. The methodological solutions that are approbated in this research offer convincing samples for their practical usage.

In Latvia LEP approach and its principles is still being applied comparatively rarely, but nowadays there is an urgent need to use it when planning various branches of economy and levels of spatial planning, for example in territorial planning, in nature protection plans of biggest Natura 2000 sites, as well as in forest management plans.

In the practice of planning, the most significant problems when integrating the results of landscape research and guidelines of LEP are caused by the insufficient legal regulation, scarcity of data, lack of interest and the inflexible approach of the existing planning practice.

In the development of the landscape ecological science and of the LEP, using of the GIS has played a significant role. As the LEP solutions in planning territories testify, nowadays effective solutions of the GIS offer the essential contribution, and they are an integral part of the LEP.

The landscape visualization methods approbated in the research work have testified that their usage reduces the presence of the widely criticized subjective attitude in landscape visual assessment. The usage of these methods allows landscaping visibility within different periods of time as well as allows access the options of landscape management and development.

In the same way, defining the scenarios and their spatial shaping is one of the most significant LEP stages because in the course of its elaboration all the summarized data about the given territory are used and this background provides a foundation for the landscape management guidelines. The elaboration of the development scenarios guarantees the simultaneous assessment and comparison of socioeconomic and ecological impacts.

In the LEP, an interdisciplinary approach has to be applied which encompasses the territorial assessment based on abiotic, biotic as well as socioeconomic factors and which offers sustainable solutions in the planning process.

REFERENCES

- [1] **Botequilha Leitão, A., Ahern, J.** Applying Landscape Ecological Concepts and Metrics in Sustainable Land Planning. *Landscape and Urban Planning* 59, 2002. p. 65-93.
- [2] **Booth, A.G.** Ecology and Planning: The Planning Component. In: Roberts, R.D., Roberts, T.M. (Eds.), *Ecology and Planning*. Chapman&Hall, London, 1994. p. 8-19.
- [3] **Watson, R.T., Noble, I.R., Bolin, B., Ravindranath, N.H., Verardo, D.J., Dokken, D.J.** Land Use, Land use Change and Forestry. *A Special Report of the Intergovernmental Panel on Climate Change (IPCC)*, 2000. Cambridge University Press, Cambridge.
- [4] **Nikodemus, O., Lakovskis, P., Konošonoka L., Beikulis, O. et al.** Ziemeļvidzemes biosfēras rezultāta ainavu ekoloģiskais plāns. Ainavu ekoloģiskās plānošanas metodika, 2007. *Latvijas Universitāte un SIA Estonian, Latvian&Lithuanian environment*.
- [5] **Farina, A.** Principles And Methods in Landscape Ecology: Towards a Science of Landscape. *Springer*, 2006.

- [6] Sanderson, E.W., Redford, K.H., Vedder, A., Coppolillo, P.B., Ward, S.E. A conceptual model for conservation planning based on landscape species requirement. *Landscape and Urban Planning* 58, 2002. p. 41-56.
- [7] Mörtberg, U.M., Balfors, B., Knol, W.C. Landscape ecological assessment: A tool for integrating biodiversity issues in strategic environmental assessment and planning. *Journal of Environmental Management* 82:4, 2007. p. 457-470.
- [8] Pitkänen, E., Eisto, K., Toivanen, A., Kammonen, A., Mustonen, S. Landscape Ecological Plan for the State owned Forests in Valtimo. *Metsähallitus - Forest and Park Service*, Vantaa, 2000.
- [9] Musacchio, L.R., Coulson, R.N. Landscape ecological planning process for wetland, waterflow and farmland conservation. *Landscape and Urban Planning* 56:3-4, 2001. p. 125-147.
- [10] Karvonen, L. Guidelines for Landscape Ecological Planning. *Forestry Publications of Metsähallitus*, 2000.
- [11] Bell, S. The Potential of Applied Landscape Ecology to Forest Design Planning. *Forestry commission*, Edinburgh, 2003.
- [12] Opdam, P., Verboom, J., Pouwels, R. Landscape cohesion: an index for the conservation potential of landscapes for biodiversity. *Landscape Ecology* 18:2, 2003. p. 113-126.
- [13] Opdam, P., Foppen, R., Vos, C. Bridging the gap between ecology and spatial planning in landscape ecology. *Landscape Ecology* 16:8, 2001. p. 767-779.
- [14] Diaz, N., Apostol, D. Forest Landscape Analysis and Design: A process for implementing land management objectives for landscape patterns. USDA Forest Service, NW Pacific Region, Portland, Oregon, 1992.
- [15] Bell S., Nikodemus O. Landscape Ecological Planning in Latvia. Riga: *University of Latvia*, 2001. p. 68.
- [16] Melluma, A. Metamorphoses of Latvian Landscapes during Fifty years of Soviet Rule. *GeoJournal* 33:1, 1994. p. 55-62.
- [17] Peneze, Z. Transformations of the Latvian Rural landscape in the 20th and 21st Centuries. PhD Thesis, University of Latvia, Riga, Latvia, 2009.
- [18] Nikodemus, O., Bell, S., Grine, I., Liepins, I. The impact of economic, social, and political factors on the landscape structure of the Vidzeme uplands in Latvia. *Landscape and Urban Planning* 70:1-2, 2005. p. 57 – 67.
- [19] Bergmanis, U. Mazā ērgļa Aquila pomarina C.L. Brehm taksonomija, izplatība, skaits un ekoloģija Latvijā. Promocijas darba kopsavilkums, Latvijas Universitāte, Rīga, Latvija, 1999.
- [20] Kaur, E., Palang, H. and Sooväli, H. Landscapes in change - opposing attitudes in Saaremaa, Estonia. *Landscape and Urban Planning* 67:1-4, 2004. p. 109-120.
- [21] Naughton-Treves, L. Predicting patterns of crop damage by wildlife around Kibale National Park, Uganda. *Conservation Biology* 12:1, 1998. p. 156-168.
- [22] Fry, G., Odeb, T.Å., Velardec, M.D. The ecology of visual landscapes: Exploring the conceptual common ground of visual and ecological landscape indicators. *Ecological Indicators* 9:5, 2009. p. 933-947.
- [23] Tress, G., Tress, B., Fry, G. Clarifying Integrative Research Concepts in Landscape Ecology. *Landscape Ecology* 20:4, 2005. p. 479-493.
- [24] Zigmunde, D. Estētiskās un ekoloģiskās saskaņas sintēze ilgtspējīgas ainavas plānošanas kontekstā. *Scientific Journal of Riga Technical University. Sustainable Spatial Development, Volume 1*. 2010. p. 94–98.
- [25] Kleijn, D., Sutherland, W.J. How effective are European agri-environment schemes in conserving and promoting biodiversity? *Journal of Applied Ecology*, Volume 40, Number 6, 2003. p. 947-969.
- [26] Palang, H., Printsman, A., Konkoly Gyuró E., Urbanc, M., Skowronek, E., Woloszyn, W. The forgotten rural landscapes of Central and Eastern Europe. *Landscape Ecology*. Volume 21, Number 3, 2006. p. 347-357.

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Pēteris Lakovskis. Ainavu ekoloģiskā plānošana un tās risinājumi Latvijā

Rakstā apkopoti pētījuma rezultāti par ainavu ekoloģisko plānošanu un tās metožu aprobāciju dažāda tipa ainavu telpās Latvijā. Pētījumā analizēts ainavu ekoloģiskās plānošanas process, sniegts apraksts plānošanas soļiem, kuri aprakstīti, balstoties uz praktisko pieredzi. Rakstā ir izvērtētas ainavu ekoloģiskās plānošanas procesa uzlabošanas iespējas. Pētījums balstīts gan uz literatūras apskatu, gan telpisko datu analīzi ainavu ekoloģiskās plānošanas teritorijās. Pētījumā izmantotas ģeogrāfiskās informācijas sistēmas, kā arī apkopoti lauka pētījumu rezultāti. Lai novērtētu ainavu pārvaldības aktualitāti un praktisko izmantošanu Latvijā, pētījuma gaitā veiktas padziļinātās intervijas ar dažādu ieinteresēto pušu pārstāvjiem. To mērķis bija noskaidrot viedokli par ainavu aizsardzības un plānošanas līdzšinējo pieredzi, nepieciešamību, kā arī iespējām uzlabot ainavu pārvaldību Latvijā. Lai gan Latvijā šāda plānošanas pieeja ir risinājumi tiek izmantoti salīdzinoši maz, tomēr mūsdienās to būtu nepieciešams izmantot dažādu līmeņu un nozaru plānošanā. Pētījums apliecina, ka ainavu ekoloģijā liela uzmanība līdz šim pievērsta ainavu metrikai, ainavu struktūras analīzei, ainavu vēsturiskās attīstības gaitas aprakstam, taču bieži vien netiek parādītas tālākās darbības – vadlīniju izstrāde, praktiski ieteikumi ainavu apsaimniekošanā vai plānošanā. Veiktais pētījums apliecina, ka ainavu ekoloģiskā plānošana un tās pieeja nodrošina daudzfunkcionālu ainavas analīzi un parāda būtiskus aspektus, kuri ne vienmēr tiek ņemti vērā dabas aizsardzības vai teritorijas plānošanā. Rakstā parādītas galvenās problēmas, kuras saistītas ar normatīvo regulējumu, plānošanas pieredzi un praksi, kā arī telpiskajiem datiem.

Петерис Лаковскис. Ландшафтно-экологическое планирование и его решения в Латвии

В статье приводятся результаты исследования по ландшафтно-экологическому планированию и апробации методов исследования в различных типах ландшафта Латвии. В исследовании проанализирован процесс ландшафтно-экологического планирования, описаны шаги планирования, основываясь на практическом опыте. В статье также рассмотрены возможности улучшения шагов ландшафтно-экологического планирования в Латвии. Исследование основано как на обзоре литературы, так и на анализе данных структур ландшафта. В исследовании были использованы географические информационные системы и полевые исследования. Для оценки актуальности управления ландшафтом и практического использования в Латвии, в ходе исследования проведены интервью с различными заинтересованными сторонами. Целью интервью было выяснить мнения по защите ландшафта и выявить опыт планирования, а также возможности для улучшения управления ландшафтом в Латвии. Несмотря на то, что в Латвии такой подход к планированию и решения используются относительно мало, современная ситуация требует использования этого подхода в планирование различного уровня и отраслей. Исследование показало, что в ландшафтной экологии большое внимания до сих пор занимает метрики ландшафта и анализ ландшафтной структуры, описания исторического развития ландшафта, но часто не указываются дальнейшие действия - разработка руководств, практические рекомендации по управлению или планированию ландшафта. Проведенное исследование показывает, что ландшафтно-экологическое планирование и его подход обеспечивает многофункциональный ландшафтный анализ и выявляет существенные аспекты, которые не всегда принимаются во внимание в ходе защиты окружающей среды или территориального планирования. В статье представлены основные проблемы, связанные с нормативно-правовой базой, опытом планирования и практической деятельностью, а также пространственными данными.