

# Professionals awareness in promotion of conservation and management of urban forests as green infrastructure of Riga, Latvia

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*Abstract:* - Urban forests are unique and highly valued resources. In recent years, attention has been drawn to the fact that now more than half of the world's population live in urban areas. Like many parts of Europe, Riga is urbanizing rapidly creating conflict situations between development of building areas and natural areas. The consequent loss and degradation of urban forests could adversely affect ecosystems as well as human well-being and cause negative externalities e.g. the loss of non-priced benefits. The aim of this paper is to review the present situation concerning the management and condition of naturalistic forest landscapes in urban areas and to study the attitude of professionals towards naturalistic forest landscapes in the urban area of Riga city, Latvia. The survey includes the opinions of representatives of different fields from Riga municipality and other institutions related to ecological, practical, planning and conservation activities, and also private working landscape architects. The statistical analysis and data's empirical distribution showed significant differences in attitudes between professional groups of managers and planners to the statements about natural renewal, freedom, contact with nature, sustainable development strategy, management cost and direct participation from the local community.

*Key-Words:* - Landscape perception, urban forest, public awareness, urban planning, green infrastructure, Riga, Latvia

## 1 Introduction

Forests produce several non-timber products, like mushrooms, berries, medicinal herbs, and alike. They also provide other services to society, like attractive landscapes, erosion prevention, hydrological regulation, biodiversity preservation, etc [1, 2]. Urban forests are universally valued as amenity-recreation places, wildlife refuges and considered essential elements for sustainable city contributing to the quality of urban life. According to Jim and Chen [3], urban forests can create significant ecosystem services, such as CO<sub>2</sub> sequestration, removing air pollutants, regulating the microclimate, and recreation. These ecosystem services contribute to improving environmental quality, quality of life, and sustainable urban development.

The process of rapid urbanization and metropolitan growth in 20th century was a consequence of technological evolution, rising living standards, increased motorization as well as general well being [4]. Compact city policies has resulted in

an increasing demand for land within city limits and demands to build on land allocated to green spaces [5]. This decreased the amount of green spaces as well as increased environmental degradation and land use change pressure on the remaining green areas.

The outcomes of the rising standard of living and changing employment and lifestyle patterns – were accompanied by an ever-growing demand for outdoor recreation. Most of this demand is met by the urban forest spaces, particularly of the 'natural' environment type [4]. For urban dwellers the main aspects that determine the amount of urban forest visits to satisfy the demand for contact with nature and recreation, are quantity and quality of these areas as well as their accessibility [5].

The naturalistic landscapes are cheaper to create and maintain than horticultural areas and therefore be more viable in the context of local authority budgets [6]. The loss and degradation of urban forests cause negative externalities e.g. the loss of non-priced benefits according to Tyrväinen and Väänänen [7],

which is concluding that in land-use planning, the forest amenity values should be systematically measured in monetary terms with material values.

The aim of this study is to review the present situation and the legislative framework concerning the management and condition of naturalistic forest landscapes in urban areas and to study the attitude of professionals of urban landscape planning and forest management towards naturalistic forest landscapes in the urban area of Riga city, Latvia in comparison to a more traditional – formal landscape.

## 2 Landscape approach in urban planning

In forest planning, little research has been devoted towards examining how landscape-impact assessment can improve the public acceptance of forest activities and augment forest sustainability [8]. Planners and designers are interested in formal projects that express spatial ideas and have meaning for the general population [9]. The role of urban green spaces differs widely between European cities and towns due their different environmental and socio-cultural background. In Latvia, as in other countries of North Europe, the decline of nature throughout the twentieth century and the alienation between people and natural world were not so significant [5]. The region of northern European forest culture covering the Baltic States, Finland, Norway, and most of Sweden has certain similarities [10].

The forest is the significant element of everyday lives and a major element of the landscape and the recreational and aesthetic benefits of urban forest are traditionally important [11, 12]. The last years the interest about design of naturalistic landscapes in urban area becomes more and more popular especially in countries of northern Europe, and the importance of ecological management has increased [13]. The new types of recreational activities are developed in European countries: 'landscape experience' and 'nature experience' are among the most important [14].

The evidence in environmental psychology indicates that attitude towards the environment is a multi – dimensional construct, however, humans emotionally relate to natural elements mostly in positive ways and the people prefer landscapes that they perceive as natural [15] and according to Lassen and Panagopoulos [16], sustainable landscape management in environmentally sensitive areas should be based on social and environmental stewardship.

Landscapes as dynamic and characteristic expressions of the interaction between the natural environment and human societies can be considered in very different ways [17]. The meaning of 'landscape' mostly emphasizes a limited area of land surface, and focuses on view/scenes or other sensory aspects of nature, artifacts and their mixtures [18, 19]. Very often the studies focus on individual ecosystem components rather than taking the whole landscape into account [20]. However, the urban landscapes are dynamic and continuously changing as a city grows in temporal and spatial scale. Extending the meaning of 'landscape' to the vast array of biological and ecological processes and conditions as well as considering the spatial- temporal changes of landscape, makes it essentially synonymous with environment or ecosystem [18].

Often the aesthetic experience and desires of people against the visual quality of natural landscape are inconsistent to ecological value of landscape. The scale at which humans as organisms perceive landscapes, is particularly important because this is the scale at which humans intentionally change landscapes, and these changes affect environmental processes [21]. The preferences should be strongly influenced by ecological knowledge. People with a greater knowledge of ecosystems should more likely prefer ecologically sustainable landscapes [22, 23].

The human's desire for aesthetic environment reflects the landscape policy and management, furthermore, the landscape management may affect where people choose to locate their home and outdoor activities, and their involvement in landscape stewardship [24]. Such a landscape perspective is critical to effective natural resource policy and management amid the changing distribution of the population across the urban landscape. The questionnaire (year 2002), realized among specialists in establishment of Latvia State Forest, only 70% of respondents agreed that they need a special knowledge of landscape, for instance, about planning and creating of landscape, for economic and social value of landscape in their daily work [25].

The evaluation of nature is an inseparable part of the process of environmental/landscape planning, management, and decision making. In recent decades, its importance has reached the global level. At local and regional levels, landscape assessment for planning and decision-making processes is a key issue in sustainable landscape management. Landscape analysis involves the evaluation of geographical, ecological and social elements of landscape which create the comprehensive multilevel hierarchical system, a landscape program, regional

landscape plan, and open space master plan will be elaborated [26].

Many big cities around the world develop “Green Infrastructure” programs which focus on identifying an interconnected network of green space that conserves ecosystem values and functions, guides sustainable development, and provides associated economic and quality-of-life benefits to communities. Although, until today, Riga city development plan does not contain the strategy for development of green infrastructure and landscape planning. The role of the local authority in Riga city has been limited in elementary rehabilitation actions and maintenance concepts.

### 3 Legislative framework for planning and management of naturalistic forest landscapes in urban areas in Riga city

Latvia legislation demands that forest protection belts are established around all cities and towns. The concept of protection belts originates from the Soviet Era and is maintained in Latvian legislation too despite the radical changes to the political system after regaining independence in 1991 [27].

In Riga city a lot of natural areas are protected (fig. 1 and fig 2) in recognition of their nature conservation importance and their contribution to the attractiveness and liveability of the city (Law on Specially protected Nature Territories, 1993) [28]. The main laws in Latvia, which define the management, and spatial characteristic of urban forest, are Law on Forest (2000) [29], Protecting Zone Law (1997, 2002, 2008) [30] and Spatial Planning Law (2002) [31].



Fig.1 Path to the beach in natural park in Riga city ‘Dabas parks Piejūra’

According to legislation, the urban forests timber production and clear – cutting are not allowed

and main management activities are applied to the pattern elements of forest and technical aspects of forest management. The legislation of Latvia does not divide differences between maintenance and management of rural and urban forest, and there are disagreements between management, functional significance and demands for real using of urban forests.

Since 1980s in Latvia there are not investigations about the recreational capacity of urban forests and demands of inhabitants for recreational use of urban forests that can provide the useful information in land use planning and in the management of urban areas.

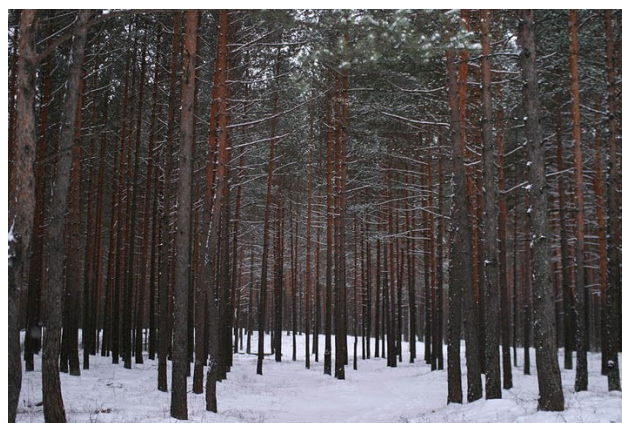


Fig. 2 Biķernieku forest in Riga city

The dynamic of land use and management of green space in Riga city are based on the numerous of documents and normative of Riga municipality. However, these documents often are in contradiction with legislation and are incomplete.

Riga city has been developing its own sustainability indicators trying to measure the quality of life issues in a meaningful way. Besides the environmental criteria, the quality of life issues are central to all the various definitions of a sustainable city [32]. Aspects such as ‘amount of public green spaces per inhabitant’, ‘structure of natural and green areas’, ‘ amount of public green areas per building areas’, ‘values of biological diversity’, ‘accessibility of public green areas’, characterize the current situation in Riga city and are involved in Riga Territory Development Plan 2006. – 2018 [33].

All unbuilt urban green areas in the inner city, according to the definition of this plan, are territories of green space and nature and there are no definitions for distinction among functional, landscape, natural, etc. features. It is, however, unclear how compact city policies and the sustainable use of green areas can be successfully combined [34]. Even though an understanding of the multiple functions of urban green spaces is reasonably well developed, it is not

well integrated into the planning, design and management process [4, 20, 35]. It is without argument that the role of the local government – as the level of administration closest to citizens – is significant and should offer strong support to the protection and management of the green spaces and the natural environment in general and the upgrade of the people's quality of life [36].

With expanding scientific knowledge of green benefits in cities, many community leaders and planners understand that systems composed of key ecological and cultural features are essential to sustainable growth and productivity. Municipal governments, therefore, have a key role in explaining to the public what biodiversity maintenance requires in practice [4]. Consequently, municipal governments are crucial in realising sustainable development in practice, both directly in the urban setting and indirectly by taking decisions about the whole landscape [37]. In the present time, municipal governments start to incorporate in their plans the modern ideas of smart land conservation and large scale thinking that provides a green solution to many of the problems associated with urban sprawling development. Green infrastructure is an emerging idea about how urban forests and green spaces can optimally generate benefits in cities using systematic planning, design and management of trees and other living materials. Green infrastructure services include stormwater management, air quality (including ozone levels), and mitigating urban heat island effects.

#### **4 Professionals attitude to naturalistic forest landscape in the case of Riga, Latvia**

The literature review suggests that there are many opportunities for the use of naturalistic landscape design and many benefits to be derived [38]. Still there are a little data on professional attitudes to urban naturalistic landscapes available. The research strategy used for the present study based on the idea that professionals are able to recognize most of the values attached to 'naturalistic forest landscape' (hereafter also NFL) in urban area. The goal of this study is to clarify and measure attitudes of towards NFL in urban area of Riga city thus to highlight the potential advantages and problems associated with the concept. The research also discerns whether a difference in attitude exists between some professional groups, and to clarify what style they prefer in their designs.

The case of Riga city was chosen because Riga is the most urbanized area in Latvia and it has

significant resources of NFL (5676 ha of woodland) in the inner city. In order to obtain a representative sample of professionals, a stratified sampling method was used. Considering respondents' involvement with the design and management of urban landscapes, the groups of territorial planners, landscape architects and urban forest managers in Riga were identified as sampling units of survey populations. The respondents were chosen in Riga municipality – territorial planners, specialists on environment of Department of City Development and Riga City Construction Board, in other institutions related to ecological, practical, planning and conservation activities - Agency of Riga Forest, Ministry of Agriculture, Ministry of Environment, Latvia Nature Foundation, State Forest Service and private working landscape architects. The total amount of respondents was 63 – territorial planners (24 respondents), landscape architects (19 respondents) and managers (20 respondents). The individual questionnaires were conducted in a period 25/01/2010 – 22/02/2010.

To investigate the professionals' attitude to NFL, the questionnaire containing 20 statements was prepared. The questionnaire was designed based on the research of Özgüner [38] about the attitude of landscape professionals to naturalistic landscapes and formal landscapes of urban areas in United Kingdom. Contrary to the research in the UK, in the present study the subject of investigation - 'naturalistic landscape' was reduced to 'naturalistic forest landscape' and some statements were replaced.

For the better understanding in the beginning of the questionnaire definitions of formal landscape (hereafter also FL) and NFL and the corresponding pictures were included. The valuation scale of 3-points (1- strongly agree, 2 – partly-agree, 3 - disagree) was used for assessing these statements in order to determine the extent to which the respondents agree or disagree. Direct verbal interaction allowed the interviewer to target specific data collection, to measure the perception of the respondents and to elicit motives behind the answers. For successful analyzing of statistical data, 3 groups of respondents were united in two groups (P, planners – 43 respondents; M, managers – 20 respondents).

The Statistical Package for Social Science (SPSS V.10) and Microsoft Excel 2007 were used to analyze the collected data. A series of Chi – square ( $\chi^2$ ) tests were applied to determine differences at a 0.1 – 0.01 significance level on attitude statement variables in order to find out the possible differences or similarities between the answers of different groups of respondents.

Cronbach's alpha ( $\alpha$ ) test, used in this survey, revealed that the total scale reliability was high ( $\alpha =$

0.78) for the attitude measurement frameworks examined, which indicates that the statements were reliable and performed well in capturing the measured construct. The table and charts were used to present descriptive results of Chi – square ( $\chi^2$ ) test (Table 1) and empirical distribution of data (Fig. 3).

The results of data' empirical distribution and statistic analyze on the perception of professionals on the value and benefits of NFL are shown that majority of professionals agreed with most of the statements (Table 1, Fig. 3).

Sixty two percent of respondents agreed and 23,8% partly-agreed with the first statement that NFL has a place in urban area. The analysis of the

respondents' comments made it clear that they have a different point of view to this statement. One of the respondents, for instance, stated that 'Formal landscape is created for a short – term rest and it should be close to residential areas, but naturalistic forest landscape must be in rural areas as a place for a long – term rest on holidays' (P-12). Other respondent argues that – 'The existence of NFL in urban area is impossible, because urban space is created for different targets. The place for NFL is close to urban area but not inside of it' (M-5).

Table 1 Results of contingency tables analysis

Statement	Quality	$\chi^2$	Significance
Values			
In urban landscape there is a place for naturalistic design	Place	0.182	0,913
NFL are more beneficial to wildlife than FL	Wildlife	2.361	0,307
NFL are more suitable for environmental education than FL	Education	1.601	0,449
Naturalistic style embodies natural renewal more strongly than can be achieved by a FL	Renewal	10.626	0,004***
In most cases, it is easier to formulate a sustainable development strategy with a NFL	Sustainability	4.842	0,088*
In most cases, it is cheaper to manage a NFL than a traditional FL	Costs	4.907	0,085*
It is easier to gain direct participation from the local community in the formation of a NFL	Community	5.127	0,077*
Seasonal changes are more pronounced in NFL than FL	Season	3.689	0,158
In most cases, it is easier to maintain a NFL than a FL	Maintenance	3.219	0,199
NFL offer a more positive experience than FL	Experience	0.007	0,996
NFL are more prone to vandalism than FL	Vandalism	0.173	0,917
Benefits			
NFL allow people to have more contact with nature than FL	Contact	7.436	0,024**
NFL allow people to more easily observe how nature works	Process	0.460	0,794
NFL allow a greater expression of feeling of freedom especially for teenagers	Teenagers	0.659	0,719
NFL are more calming than are FL	Calming	4.439	0,108
NFL allow greater freedom of thought than do FL	Freedom	7.288	0,026**
NFL are more exciting/interesting than are FL	Exciting	1.649	0,438
The general public easily differentiate between FL and NFL	Differentiate	3.193	0,202
The public often prefer a naturalistic site to a formal traditional park	Preference	3.327	0,189
A being in NFL is not safe than are in FL	Safety	0.451	0,798

Designations: \* -  $p < 0.1$ ; \*\* -  $p < 0,05$ ; \*\*\* -  $p < 0.01$

The majority of respondents from both groups (70%) agreed with the formulation that NFL is more suitable for environmental education than formal landscapes. Although 10% disagreed with this formulation and as one respondent answered: 'Both kinds of landscapes have appropriate elements for environmental education' (M-10). The statement that NFL embodies natural renewal more strongly than can be achieved by a formal landscape, 80% of

respondents confirmed, but commented that 'The evidence of invasive species is very successful example of natural renewal, but it is not appropriate for NFL in urban area' (P-14). Although, the majority recognized that NFL embodies natural renewal more strongly, the results of the statistical test, presented in

Table 1, suggest a significant difference for this statement between the respondent groups ( $p < 0.01$ ). Surprisingly low agreement in both groups of the



respondents (52%) is about the statement that it is easier to formulate a sustainable development strategy with a NFL. The results of the statistical test, presented in Table 1, suggest difference for this statement between the respondent groups ( $p < 0.1$ ).

The answers show a high rate of partial-agreement – 35%. The analysis of the professionals' comments on the statement revealed the recognition of advantage in FL for targets of sustainable development. As one respondent answered, 'The principles of sustainable development in FL are possible to develop successfully too. The FL is not just flowerbeds on the concrete' (M-14). The analyses showed that 64% of the respondents from both groups agreed that it is cheaper to manage a NFL than a traditional FL in most cases. Although the results of the statistical test, presented in Table 1, suggests a difference for this statement between respondent groups ( $p < 0.1$ ).

To the next statement that it is easier to gain direct participation from the local community in the formation of a NFL, there is not a common consensus between professionals (55%) on the value. 28% of respondents gave partial – agreement with the statement. One respondent agreed with the statement, because 'In Riga to gain direct participation from the local community for formation of a NFL is priority for NGOs. In Riga there is not experience about forming of FL with community support' (P-8). However, the statistical test suggests a significant difference ( $p < 0.1$ ) for this statement between managers and territorial planners.

The answers to the next statement that seasonal changes are more pronounced in NFL than FL shows the similar situation – agreed to this statement 47%, and partially-agreed – 27% of respondents. One respondent from the managers group thinks that 'An effect of seasonality is more evident in FL by using different flowers and plants' (M-19). Quite low agreement (50%) is shown by the answers to the next statement about that it is easier to maintain a NFL than a FL. In the answers there was often the following opinion 'NFL occupies wider areas as FL and the maintenance needs special knowledges' (M-16).

The minority of the respondents (28%) agreed that NFL offers a more positive experience than FL. A great number of the respondents - 33% partially-agreed with the statement, because 'FL is created with the main target to get positive experience' (P-16). One respondent disagreed because 'For well-educated person a NFL can give positive experience, but for ordinary person – it is just a 'jungle' what he sees' (M-2).

A similar trend can be seen in the answers to the

next statement – 43% of the respondents from both groups disagreed that NFL are more prone to vandalism than FL and answered in the following way: 'In NFL there is a lack of recreational facilities, flowerbeds and other artificial elements and there are less opportunities for vandalism' (P-23). One respondent, who agreed with this statement highlighted that 'Fear of social condemnation decreases rate of vandalism in FL, but increases – in NFL' (P-18).

The following part of the questionnaire about benefits of NFL included 9 statements. Although, the majority of the respondents (88%) recognized that NFL allow people to have more contact with nature than do FL, the results of the statistical test, presented in Table 1, suggests a significant difference for this statement between respondent groups ( $p < 0.05$ ). One respondent disagreed: 'The population mostly is not ready for the contact with NFL in Latvia' (M-20).

Very high agreement – 90% of respondents show the analysing of the next statement that NFL allow people more easily to observe how nature works than do FL. The vast majority of the respondents – 82 % agreed that NFL allow a greater expression of feeling of freedom especially for teenagers. A remark made by one of the respondents almost sums up the comments made on this statement: 'In NFL there is not social condemnation and supervision, not restrictions for loud behavior – all this gives an illusion of freedom for teenagers' (M-5). The group of the respondents has a controversial opinion and they disagree, because 'Teenagers from urban area become confused in NFL. In FL there are a lot of facilities for activities for teenagers' (P-34). Only 50% of the respondents in both groups agreed and 40% of respondents' partially – agreed to the statement that NFL are more calming than FL.

The research of the respondents' comments on the statement revealed that professionals think that it depends on the individual preferences and the perception and desires of people are very different. Quite similar situation is shown by the answers to the next statement about freedom of thought in NFL – agreed with the statement 54% and partially – agreed – 32%. The results of the statistical test, (Table 1), suggest a significant difference for this statement between respondent groups ( $p < 0.05$ ). The answer of one respondent shows that main argument for partially-agreed with the statement, is that 'Although in NFL nothing disturbs the freedom of thoughts; in FL there are more possibilities to release imagination' (P-22).

A big difference in answers appears to the next statement that NFL is more exciting/interesting than

FL. Agreed with the statement – 30%, partially – agreed – 46% and disagreed – 22%. The analysis of the answers shows that on the one hand, there is opinion that NFL is something inappropriate for urban dwellers and that is the main reason to be excited, but on the other hand, FL are created with the main target to get more exciting feelings by colors, different plants and elements of art.

Majority of the respondents - 87% agreed that the general public can easily differentiate between FL and NFL. A low level of agreement is shown by the answers to the next statement that people often prefer a naturalistic site to a formal traditional park: 41% of the respondents agreed, 36% - partially – agreed and

22% disagreed. The analysis of the last statement that being in NFL is safe shows the equal balance between agreement and partial – agreement (together – 48%) and disagreement (52%). One person argued: *'I agree, because if people have special knowledge about natural processes, it is safe'* (P-24). Another respondent answered: *'I agree, because in FL there are more opportunities for anti – social behavior and a feeling of damage in parks is more actually'* (M-6).

The restriction of professional' number in this case leads to considerations to prepare the similar questionnaire in the whole country.

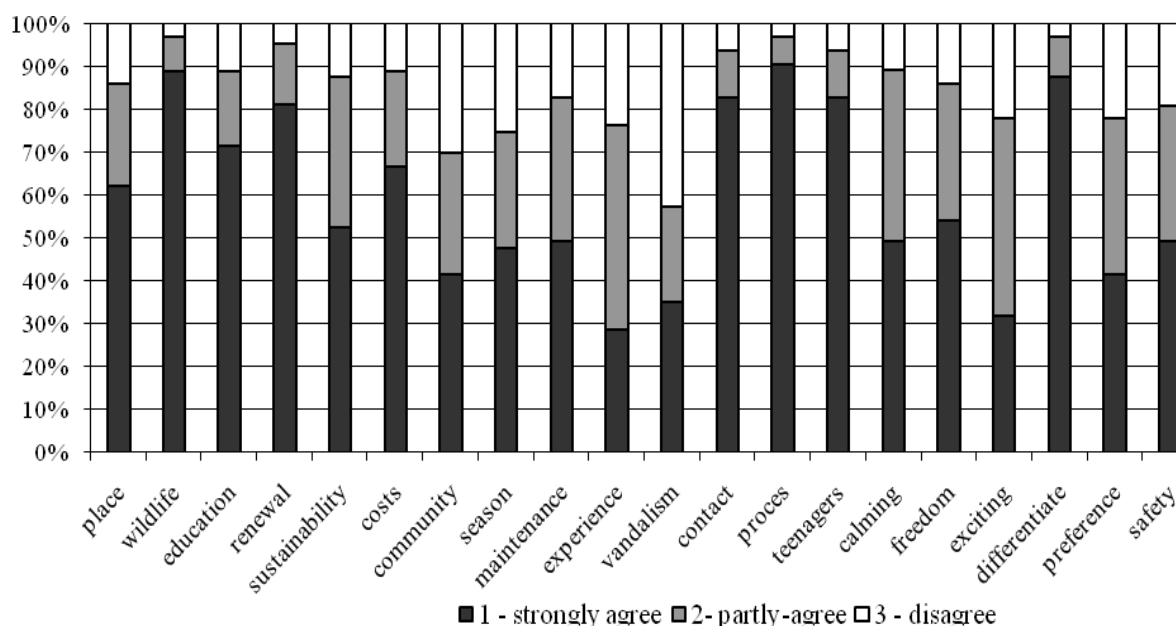


Fig. 3 Professionals' perceptions on values and benefits of urban naturalistic forest landscapes.

Urban forest landscape preferences have probably regional differences and landscape preferences in a capital city do not comprehensively represent preferences in other cities or municipalities [13]. The results of the research showed that professionals from groups of managers, planners and landscape architects in Riga city recognize the values and benefits of NFL and confirm the common expectation from previous studies [38].

This approach suggests that preferences should be strongly influenced by ecological knowledge. People with a greater knowledge of ecosystems should more likely prefer ecologically sustainable landscapes [22]. Through the series of statistical analyze it became clear that there is no big difference between opinions of two target groups. The greatest significance ( $p < 0.01$ ) shows the answer to the statement about natural renewal, the significance

$p < 0,05$  shows the answers to the statement about freedom of thoughts and about contact with nature. Less-essential significance ( $p < 0.1$ ) shows the opinions of representatives in both groups about sustainable development strategy, about costs to manage a NFL and direct participation from the local community (Table 1).

The results of the analysis of the data' empirical distribution show that to the statements which are connected with psychological perception (about experience, calming, feelings of freedom and exciting, preferences and feelings of safety), the answers show very small differences.

The research has confirmed that landscape evaluation has a close link to important emotion-related psycho-physiological responses and environmental preferences may depend more on affective reactions than on any knowledge-based

logical operations [38]. To the open-ended question for landscape architects what style they prefer in their designs, the common opinion was that design of naturalistic landscape is not actual in Riga. The comments showed that landscape architects mostly work in a formal style.

The design of urban green space in Riga, as in other European countries, is influenced mostly by the 18th century English landscape movement, and a Victorian view of nature as something to be contained, conquered and controlled [6,39]. However, the significance of naturalistic forest landscape is recognized, but some time will be necessary for changes in perception, supported by political decisions and educational programs.

## 5 Conclusion

Landscape and its conservation are complex issues that can be perceived differently according to the varying needs, knowledge and values of people. It happens that this conservation is not always welcomed by those who have other priorities (e.g. economic development). However, since urban development has an impact on landscape and biodiversity is essential to make people aware of the importance of preserving biodiversity, among others through conservation and naturalistic management practices. The concept of landscape is very wide, there are several definitions and the attitude to landscape mostly is shaped by individual environmental perception [40] and partly – with ecological knowledge. The decision makers in Riga municipality have different backgrounds and their knowledge about landscape as an ecological state is very distinctive.

Riga city development plan does not contain the strategy for development of green structure and landscape planning. This is very important to work out the normative for landscape protection corresponding to The European Landscape Convention (in force since 2004), and to develop the landscape ecological approach for evaluating and management of urban green space.

The results of the research show that professionals from both target groups – managers and planners in Riga city recognize the values and benefits of naturalistic forest landscape. Significant differences were found in attitudes between professional groups of managers and planners to the statements about natural renewal, freedom of thoughts, contact with nature, sustainable development strategy, costs to manage a NFL and direct participation from the local community.

In practice the landscape evaluation has a close link to important emotion-related psychophysiological responses and environmental preferences may depend more on affective reactions than on any knowledge-based logical operations. In design of landscape in Riga city the formal style is dominated over the naturalistic style and some time is necessary for changes in perception, supported by political decisions and educational programs. As well as public participation has become increasingly more important, playing a relevant role in determining the way society will manage and protect environment [41, 42], the present study creates a better understanding of public awareness and performance in the promotion of conservation of urban forest landscapes in Riga, Latvia. More science and professional practice is needed to improve understandings of how to install, manage and protect green infrastructure most effectively in cities

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### *References:*

- [1] Loures L., Santos, R., Panagopoulos T., 2007. Urban parks and sustainable city planning - The case of Portimão, Portugal. *WSEAS Transactions on Environment and Development* Vol. 3, 2007, 171-180.
- [2] Gomes, PDM., Panagopoulos, T. Opportunities for Sustainable Design in Renovation of the Stanaway Park, Dublin, Ireland. In Eds. Panagopoulos, T, Burley, J. *Proceedings of the 1st WSEAS Int. Conf. on Landscape Architecture*, June 11-13, 2008 Faro, Portugal, pp: 81-85.
- [3] Jim, C.Y., Chen, W. Y., Ecosystem services and valuation of urban forests in China. *Cities*, Volume 26, 2009, pp. 187-194.
- [4] Sandström U.G., Angelstam P., Khakee A., Urban comprehensive planning – identifying barriers for the maintenance of functional habitat networks, *Landscape and Urban Planning*, Vol. 75, 2006, pp.43–57.
- [5] Tyrväinen L., Pauleit S., Seeland K., de Vries S., In: Konijnendijk C.C., Nilsson K., Randrup T.B., Schipperijn, J. (eds) (2005) *Urban forests and trees. A reference book*, Springer-Verlag, Berlin Heidelberg, Germany,



- 2005, pp.81-114.
- [6] Bryant M.M., Urban landscape conservation and the role of ecological greenways at local and metropolitan scales, *Landscape and Urban Planning*, Vol. 76, 2006, pp. 23–44.
- [7] Tyrväinen, L., Väänänen, H. The economic value of urban forest amenities: an application of the contingent valuation method. *Landscape and Urban Planning*, Vol. 43, 1998, pp. 105-118.
- [8] Panagopoulos T. Linking forestry, sustainability and aesthetics. *Ecological Economics*, Vol. 68, 2009, pp: 2485-2489.
- [9] Burley, J., Wang, Y. Peace Parks a Global Perspective. *WSEAS Transactions on Environment and Development* Vol. 5, 2009, pp 65-75
- [10] Gundersen V., Frivold L.H., Myking T., Øyen B.H., Management of urban recreational woodlands: The case of Norway, *Urban Forestry & Urban Greening*, Vol.5,2006, pp.73–82.
- [11] Tyrväinen L., Gustavsson R., Konijnendijk C., Ode Å., Visualization and landscape laboratories in planning, design and management of urban woodlands, *Forest Policy and Economics*, Vol. 8, 2006, pp. 811– 823.
- [12] Yli-Pelkonen V., Kohl J. 2005. *The role of local ecological knowledge in sustainable urban planning: perspectives from Finland*. Available at: <http://ejournal.nbii.org/archives/vol1iss1/0410-007.yli-pelkonen.pdf> 25.02.2010.
- [13] Tyrväinen L., Silvennoinen H., Kolehmainen O., Ecological and aesthetic values in urban forest management, *Urban Forestry and Urban Greening*, Vol. 1, 2003, pp.135–149.
- [14] Pröbstl U., Elands B., Wirth V., Forest recreation and nature tourism in Europe: context, history and current situation. In: Bell S., Simpson M., Tyrväinen L., Sievänen T., Pröbstl U. (eds), *European Forest recreational and tourism. A handbook*, Taylor&Francis Group, London and New York, 2008, pp.12-32.
- [15] Balram, S., Dragičević S., Attitudes toward urban green spaces: integrating questionnaire survey and collaborative GIS techniques to improve attitude measurements, *Landscape and Urban Planning*, Vol. 71,2005, pp.147–162.
- [16] Lassen, M.S., Panagopoulos, T. Environmental awareness at the protected area of Brilhante, Brazil. *International Journal of Energy and Environment*, 2, 2008, pp: 1-8.
- [17] Maruani T., Amit-Cohen I., Review. Open space planning models: A review of approaches and methods, *Landscape and Urban Planning*, Vol.81, 2007, pp. 1–13.
- [18] Daniel T.C. Whither scenic beauty? Visual landscape quality assessment in the 21st century, *Landscape and Urban Planning*, Vol.54, 2001, pp. 267-281.
- [19] de Groot W.T., van den Born R.J.G., Visions of nature and landscape type preferences: an exploration in The Netherlands, *Landscape and Urban Planning*, Vol.63, 2003, pp.127–138.
- [20] Weng Y.C., Spatiotemporal changes of landscape pattern in response to urbanization, *Landscape and Urban Planning*, Vol.81, 2007, pp.341–353.
- [21] Gobster P.H., Nassauer J.I., Daniel T.C., Fry G., The shared landscape: what does aesthetics have to do with ecology?, *Landscape ecology*, Vol.22, 2007, pp. 959 – 972.
- [22] Gobster P.H., An ecological aesthetic in forest landscape management, *Landscape Journal*, Vol.18, 1999, pp.54–64.
- [23] Ramos, R.B., Panagopoulos T. Integrating aesthetic and sustainable principles in stream reclamation projects. *WSEAS Transactions on Environment and Development* Vol. 3, 2007, 189-195.
- [24] Dwyer J.F., Childs G.M., Movement of people across the landscape: a blurring of distinctions between areas, interests, and issues affecting natural resource management, *Landscape and Urban Planning*, Vol.69, 2004, pp.153–164.
- [25] Melluma A., Krūmiņš R., Lūkins M., Rungule R., Zariņš J., *Developing of models for landscape ecological planning in forest management. Final report*, 2004, available at: [http://www.lvm.lv/tools/download.php?name=files%2Ftext%2FAinavas\\_teksts.pdf](http://www.lvm.lv/tools/download.php?name=files%2Ftext%2FAinavas_teksts.pdf), 30.03.2010.
- [26] Mander Ū., Landscape planning. In: Bartell S., Chon T-S., Elser J., Grant W., Palmeri L., Svirejeva-Hopkins A., Vymazal J., Bastianoni S., de Angelis D., Graham M., Harmsen R., Svirezhev Y., Voinov A. (eds), *Encyclopedia of Ecology*, Elsevier B.V., 2008, pp.2116 – 2126.
- [27] Donis, J., Designating a greenbelt around the city of Riga, Latvia, *Urban Forestry & Urban Greening*, Vol. 2, 2003, pp. 31-39.
- [28] *Law on Specially Protected Nature Territories Latvia*, 1993, Available at: [http://www.ttc.lv/export/sites/default/docs/LRTA/Likumi/On\\_Specially\\_Protected\\_Nature\\_Territories.doc](http://www.ttc.lv/export/sites/default/docs/LRTA/Likumi/On_Specially_Protected_Nature_Territories.doc), 30.03.2010.
- [29] *Law on Forest Latvia*, 2000, Available at: [http://www.ttc.lv/export/sites/default/docs/LRTA/Likumi/Law\\_on\\_Forests.doc](http://www.ttc.lv/export/sites/default/docs/LRTA/Likumi/Law_on_Forests.doc), 30.03.2010.
- [30] *Protection Zone Law Latvia*, 1997, Available

at:

[http://www.ttc.lv/export/sites/default/docs/LRTA/Likumi/Protection\\_Zone\\_Law\\_.doc](http://www.ttc.lv/export/sites/default/docs/LRTA/Likumi/Protection_Zone_Law_.doc),

30.03.2010

- [31] *Spatial Planning Law Latvia*, 2002, Available at: [http://www.ttc.lv/export/sites/default/docs/LRTA/Likumi/Spatial\\_Planning\\_Law.doc](http://www.ttc.lv/export/sites/default/docs/LRTA/Likumi/Spatial_Planning_Law.doc), 30.03.2010.
- [32] Chiesura A., The role of urban parks for the sustainable city, *Landscape and Urban Planning*, Vol.68, 2004, pp.129–138.
- [33] *Riga development plan*, 2009, Available at: [http://www.rdpad.lv/en/rap\\_en/](http://www.rdpad.lv/en/rap_en/), 30.03.2010.
- [34] Tyrväinen, L., Economic valuation of urban forest benefits in Finland, *Journal of Environmental Management*, Vol. 62, 2001, pp.75–92.
- [35] James P., Tzoulas K., Adams M.D., Barber A., Box J., Breuste, J., Elmqvist T., Frith M., Gordon C., Greening K.L., Handley J., Haworth S., Kazmierczak A.M., Johnston M., Korpelam K., Morettin M., Niemela J., Pauleit S., Roe M.H., Sadler J.P., Thompson C.W., Towards an integrated understanding of green space in the European built environment, *Urban Forestry & Urban Greening*, Vol.8, 2009, pp. 65–75.
- [36] Alexandropoulou A., Cappos A., Building a Green Space Strategy – A journey through the Greek local authorities’ realm – The case of Halandri, In: Costa C.S., Mathey J., Edlich B., Hoyer J.(eds) *Urban green spaces – a key for sustainable cities. International conference on urban green spaces*, GreenKeys Project, IOER Dresden, Germany, 2008, pp. 35-37.
- [37] EEA, *Towards Sustainable Development for Local Authorities – Approaches, Experiences and Sources*. European Environment Agency, Copenhagen, 1997
- [38] Özgüner H., Kendle D., Bisgrove R.J., Attitudes of landscape professionals towards naturalistic versus formal urban landscapes in the UK, *Landscape and Urban Planning*, Vol. 81, 2007, pp. 34–45.
- [39] Jorgensen A., Hitchmough J., Calvert T., Woodland spaces and edges: their impact on perception of safety and preference, *Landscape and Urban Planning*, Vol.60, 2002, pp. 135–150.
- [40] Van den Toorn, M. Landscape Architecture: The design of change. *WSEAS Transactions on Environment and Development* Vol. 2, 2006, pp 245-254.
- [41] Loures, L. Crawford, P. Democracy in Progress: Using Public Participation in Post-

Industrial Landscape (Re)-Development. *WSEAS Transactions on Environment and Development* Vol. 4, 2008, 794-803.

- [42] Qiuxia, Y. Level of community participation and sustainability of forestation project in indigent area. *WSEAS Transactions on Environment and Development* Vol. 2, 2006, pp 347-359.