

## EVALUATION OF LANDSCAPE ECOLOGICAL AESTHETICS OF GREEN SPACES IN LATVIAN LARGE CITIES

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**Abstract.** Recently wide process of urbanisation and migration of inhabitants from rural areas to large cities occurs in Latvia. The proportion of green areas in urban territories is decreasing with time, therefore it is important to maintain the existing greenery system and build a new ecosystem that would connect the existing areas. Currently the principles of landscape ecology and aesthetics are not always included in urban planning or land use plans in Latvia. The aim of the study was to assess landscape ecological aesthetic characteristics of green areas in four Latvian cities – Liepāja, Jelgava, Rēzekne and Valmiera. The evaluation matrix contains the following criteria for assessing the landscape aesthetics: the order, accordance to the nearby architecture, visible human intention, particularity, and the following criteria for assessing the landscape ecology: biodiversity, dominance of native species, naturalness and wilderness. In the research, a variety of urban green areas – such as parks, squares and waterfront areas – was evaluated.

**Keywords:** landscape aesthetics, landscape ecology, urban ecosystems, green areas, landscape architecture, Latvia.

### Introduction

Urban landscape encompasses very different types of the land use, one of such being public open spaces. They range in extent and location from very small plazas and yards in the city centre to large conservation areas at the urban fringe. These landscapes are highly dominated by human intention and often include maintained natural areas or abandoned sites that look quite wild (Gobster *et al.* 2007). Green spaces in cities are connected by the system of green corridors and make up a city's green network.

Public green spaces have been developed in cities since the 1880-ies to counter environmental impacts of urban expansion. Plants provide a wide range of environmental benefits and functions. Urban green spaces offer a habitat for a diversity of flora and small animals, and provide accessible sites with natural components for inhabitants living in separation from nature (Jim, Chen 2002). There are many environmental, aesthetical, social and even economic benefits arising from open and green spaces.

Nevertheless, urban parks and green spaces have been neglected for a long period of time. Parks are designed for recreation, but they also provide other ecosystem functions as microclimate regulation, air quality control, storm water management and wildlife habitat (Lovell, Johnston 2009), as well as educational and research function. Green spaces increase the quality of life for urban residents reducing stress and supporting recovery from illness. The social val-

ue is often reflected by the increased economic value of the real estate surrounding green areas and willingness to pay in order to have these spaces available (Lovell, Johnston 2009; Jim, Chen 2002). Aesthetical function of attractive public spaces offers feelings of pleasure to the inhabitants of the city (Gobster *et al.* 2007).

Population is growing and getting more urbanized. Urban processes create different spatial pattern in the city landscapes as compared to the rural area. Urbanization has led to a decrease in available green spaces of cities and has a permanent influence on existing natural territories next to the city (Zigmunde 2007). Latvian green spaces in most cases fall within a category of landscape park type with romantic atmosphere in accordance with nature, landscape changeability, naturalism and even a little wilderness. Urban parks often are the only 'green islands', where lots of different living organisms dwell. Natural territories in Latvia include greenery, meadows, forests, natural waterfront, streets and roads. There are historically developed parks (Fig. 1), squares and front gardens (Fig. 2) which serve as recreation areas and maintain landscape diversity of cities in Latvia. Parks and squares are public-accessible green areas with greenery, small architectural forms and variety of use options (quiet and active recreation); they have great aesthetical significance and require regular maintenance and restoration of planting (Briņķis, Buka 2006).



Fig. 1. Historical Landscape Park of Jelgava Palace.  
Source: the author's photos (2012)



Fig. 2. Plaza of roses with geometrical design in the centre of Liepaja. Source: the author's photos (2012)

Cities selected for the study were Latvian cities with high number of population located in four different planning regions of Latvia. Liepaja is located next to the Baltic Sea in Kurzeme; Jelgava is situated in the centre of the Zemgale plain with a variety of high-value ecological biotopes; and Rezekne is a city with the typical hilly relief and blue-green area of Latgale. Finally, Valmiera was selected in the region Vidzeme and is located in the picturesque riverside of the River Gauja.

The main purpose of this study was to assess the landscape ecological aesthetic characteristics of green areas in four Latvian cities – Liepaja, Jelgava, Rezekne and Valmiera. In order to achieve it, the following objectives were defined:

- to manage the landscape inventory of the current state in 32 green spaces located in Liepaja, Jelgava, Rezekne and Valmiera;

- assess landscape ecological aesthetics in the selected research objects using evaluation matrix; and
- compare existing situation and condition of green areas in the selected Latvian cities.

Based on the research results, possible development of landscape ecological aesthetics in green spaces of Jelgava, Liepaja, Valmiera and Rezekne will be carried out in further studies.

## Materials and Methods

The basis of the research was 32 public green spaces in Liepaja, Jelgava, Rezekne and Valmiera cities. Landscape survey, inventory and assessment of ecological aesthetics were managed on the spot of these cities (Table 1). Research was divided into three stages – landscape inventory-taking, assessment of the landscape ecological aesthetics and comparison of cities.

Table 1. General characteristics of the selected cities

	Liepaja	Jelgava	Rezekne	Valmiera
Total area	60,37 km <sup>2</sup>	60,32 km <sup>2</sup>	17,48 km <sup>2</sup>	18,18 km <sup>2</sup>
Population	82386	63534	31401	25130
Area of parks and forests	1105 ha	1426 ha	214 ha	382 ha

Source: created by the author (Liepaja city...; Jelgava city...; Rezekne city...; Valmiera tourism...)

Liepaja is the third largest city in Latvia. Coastline of Liepaja consists of an unbroken sandy beach and dunes. Liepaja is a 'green city', because 18% of the common city area consists of green areas and nature reserves, which include parks, gardens, forests, waters and other values of nature (*Liepaja city...*). Jelgava is the largest city in the Zemgale region. Jelgava is situated on the banks of the Lielupe River; the total area of the city is 60 km<sup>2</sup>, 1.62 km<sup>2</sup> of which is covered by parks. (*Jelgava city...*). Rezekne is located in the Northern descent of the Latgale Highland. Rezekne lies on seven hills; the River Rezekne flows through the city, joining the largest lakes of Latvia. According to the number of population, Rezekne is the seventh largest city in Latvia (*Rezekne city...*). Valmiera is the largest city of the historical Vidzeme region. The most beautiful image of Valmiera is the rapid and ever changing River Gauja and its natural riverbanks (*Valmiera tourism...*).

In the research, the general scientific qualitative research methods were applied. The subject of the research was the ecological aesthetic quality of public green spaces. During the research, landscape inventory of the selected cities was carried out within the framework of landscape description (Ainavu... 2000). Different types of public green spaces were selected for the research: parks, squares, plazas and waterfront areas surveyed. Parks were defined as areas, which cover the territories of 2.1–50.0 ha, and squares (gardens) occupy the area of 0.1 to 2.0 ha. Plaza is an area dominated by a lawn or hard groundcover that is often used for wide public events (Jim, Chen 2002). Waterfront areas are covered with greenery and naturally developed vegetation in the coastal area next to the watercourses, which provide access to water protecting it against environmental pollution, as well as providing biological and landscape diversity of the city. Two waterfront areas, fifteen parks, twelve squares and three plazas in selected cities were analyzed in the research (Fig. 3).

The inspection matrix for the landscape inventory included sections of the existing plant species, condition of man-made elements, architectural coherence, established presence of wildlife, land management, function and landscape components. In the landscape inventory common trees, shrubs, annuals and perennials of the analyzed green spaces were marked using plant species key-book (Mauriņš, Zvirgzds 2006). Photo fixation of the current situation was

carried out in the beginning of the landscape inventory during the research from July to September 2012 covering a period from summer in full bloom to Indian summer. Pictures were attached to inspection matrix as visual material for further assessment of the landscape ecological aesthetics.

The landscape ecological aesthetics assessment method (Jankevica 2012) was used to compare different values of the chosen areas. Selected green areas were assessed and grouped by aesthetic and ecological categories using grades 1–5: 1 – being the lowest and 5 the highest. The assessment matrix consisted of the following criteria for assessment of landscape aesthetics: order (Ode 2008), quality of man-made elements (Nassauer 1995; Ode 2008), visible human intention (Nassauer 1995; Sheppard 2001), particularity (Ziemeļniece 1998), use of outlandish species (Ignatieva 2012) and accordance with architecture (Ziemeļniece 1998; Briņķis, Buka 2006), and the following criteria for assessment of landscape ecology: biodiversity, accordance with landscape type, use of native species, wilderness, presence of wildlife and naturalness (Nassauer 1995; Sheppard 2001; Gobster *et al.* 2007; Ode 2008). Term ‘biodiversity’ was used in this research to refer to the number of established indigenous plant species, but not to the number of individuals in each species of the landscape (Nassauer 1993). Term ‘wildlife’ was used to enumerate occurrence of different types of animals (insects, birds, etc.).

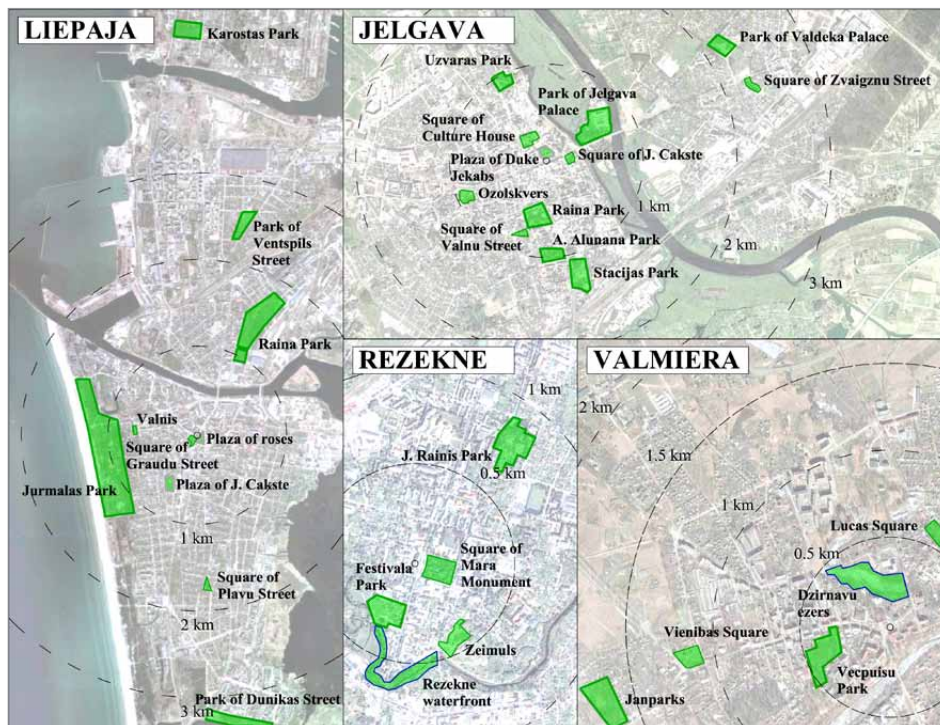


Fig. 3. Distance from the city centre and location of the selected areas in four cities.  
Source: created by the author on Google Maps

## Results and Discussion

### Landscape Inventory

The selected research objects occupied different areas and configuration. The largest green area was Jurmalas Park in Liepaja – 35 ha. Other green spaces in Liepaja also have wide research area, for example Raina Park (15,15 ha) and Park of Dunikas Street (13,4 ha).

In general, 81 different tree species, 45 shrub species, 11 annuals and 43 perennials were found in the examined 32 objects. Only 48 of them were native (indigenous) species. Foreign plant species made up about one-third of the entire national territory of the total number of species found in Latvian flora. However, most of these species are not common. Some of them can grow only in man-maintained parks and gardens, rarely in the wild (Priede 2007). The study showed as well that in most of the cases 30% of determined species in the selected area were indigenous. Dominant native tree species found in the surveyed green spaces were common lime (*Tilia cordata*), Norway maple (*Acer platanoides*), English oak (*Quercus robur*), silver birch (*Betula pendula*) and common ash (*Fraxinus excelsior*). The most widespread foreign tree species in the majority of green spaces were horse chestnut (*Aesculus hippocastanum*) and white cedar (*Thuja occidentalis*). Shrub plantings in most cases consisted of the non-native species: common lilac (*Syringa vulgaris*) and mock orange (*Philadelphus coronarius*).

The inventory showed that in parks and waterfront areas more different plant species including native vegetation could be found. It was determined by the area (sq.m.) of territory and history of green areas. Most of the gardens and plazas had recent improvements and their greenery was found full of new and modern plant species, not characteristic for the Latvian flora. Many small green spaces included different cultured flower species, but not wildflowers that occurred in Latvian landscape of meadows. The study revealed that urban greenery had different regional characteristics. For example, in Liepaja white birch (*Betula pubescens*) was found more often than silver birch. In addition, different poplar (*Populus*) species were used more frequently in formation of greeneries of Liepaja compared to other cities. An unexpected finding was in Valmiera, where the parks were dominated by Scots pine (*Pinus sylvestris*), although it was not specific to the ecosystem of this city area.

The inventory identified rare (unique) non-native species of trees that grow in Latvia extremely rarely. 36 rare plant species were marked. Most of them were located in

old parks next to the historical buildings. Ten of such species were found in the Park of Jelgava Palace (Jelgava), 15 in Jurmalas Park (Liepaja), seven in the Park of Valdeka Palace (Jelgava) and six in Raina Park (Jelgava). The most popular rare plant species were white walnut (*Juglans cinerea*), Manchurian walnut (*Juglans mandshurica*), hybrid black poplar (*Populus x canadensis*), black locust (*Robinia pseudoacacia*) and European larch (*Larix decidua*).

Man-made facilities of green spaces were characterized by the condition of hard groundcover, use of benches and lighting, as well as various elements of landscape enrichment - water features and art objects. Green spaces were divided into four groups according to the results of inventory. The first group included new or restored green spaces and old parks where improvement elements were maintained and managed – 76–100% of the found elements were in good quality (Raina Park and Jurmalas Park in Liepaja). Parks and gardens with recent improvements were the Square of J. Cakste monument, Square of Valnu Street, Ozolskvers, Uzvaras Park (Jelgava), Plaza of roses, Valnis, Square of Plavu Street (Liepaja), Square of Mara monument, Zeimuls (Rezekne) and Dzirnava ezers (Valmiera). Two parks in Rezekne were found in the process of restoration and in summer 2013 they would be included in the first group with new and modern facilities. The second group contained green spaces of old design, but the improvement of the area was carried out regularly and found aesthetically satisfying: 50–75% of good quality elements (A. Alunana Park, Stacijās Park, Park of Jelgava Palace, Raina Park, Square of Zvaigznu Street in Jelgava; Park of Ventpils Street in Liepaja and Lucas Square in Valmiera). The third group included green areas, which had old design mostly of the Soviet heritage and had a need for improvement and qualitative elements of small garden architecture: 10–50% of good quality man-made elements (Plaza of Duke Jekabs, Square of Culture house in Jelgava; Square of Graudu Street, Plaza of J. Cakste in Liepaja; J. Rainis Park in Rezekne; Vecpuišu Park and Vienibas Square in Valmiera). Green spaces without any improvement that were fully left for unaffected nature process were registered in the last group (Park of Valdeka Palace in Jelgava; Karostas Park and Park of Dunikas Street in Liepaja; Janparks in Valmiera). There is no need of man-made elements in wild nature park in contrary to green spaces with an old park atmosphere or modern meeting place for the city people.

The park atmosphere was found affected by historical elements identified in some green areas. In some cases it was a monument or fragments of historical walls. The area of Rezekne green building 'Zeimuls' bordered with the

historic castle mound, so the new building was constructed in accordance with the green hill (Fig. 4). Criterion of history leads to the next criterion of accordance with architecture. Some green areas were found historically formed next to significant architectural buildings (Park of Jelgava Palace, Park of Valdeka Palace in Jelgava; Jurmalas Park in Liepaja), but some areas had none of such coherence, for example, Uzvaras Park that was landscaped without linking it to the nearby Villa Medem. In two cases, the park was found retained its historic cobble-bed, which created an axis to the nearby historic buildings (A. Alunana Park in Jelgava and Karostas Park in Liepaja).

Results of the research of the green zone management revealed that most of the green areas are regularly maintained. Lawns were mown, planting beds of bushes mulched, shrubs shorn, new trees planted and flowerbeds designed in almost all of green spaces that represented the first three groups of areas divided by the quality of man-made elements. The areas without improvement were left



Fig. 4. New green building 'Zeimuls' with landscaped courtyard in Rezekne. *Source:* the author's photos (2012)



Fig. 5. Janparks in Valmiera – natural area. *Source:* the author's photos (2012)

for wildlife influence and were not regularly maintained (Fig. 5). In tree-cutting cases, tree stumps were preserved in parks. In two areas visible stewardship could be observed. In Dzirnava ezers (Valmiera) and Raina Park (Liepaja) some fragments of green spaces were found preserved untouched with natural vegetation for wildlife. At the same time, signs of human intention could be perceived.

In all green areas, birds by their songs and various insects were found. Birdcages were situated in parks of Jelgava and Liepaja, especially in sites where children appear. In green areas with ponds, river ducks adapted to conditions of life in a city were found. Anthills could be seen in abandoned parks. In this kind of parks, the presence of mammals like molehill and squirrel picking cones was detected as well.

#### *Assessment of Landscape Ecological Aesthetics*

The selected objects were analyzed according to the following groups: parks, squares, plazas and waterfront areas. Two green spaces were excluded from further evaluation due to their unfinished state (Festivala Park and Rezekne Waterfront). The green area and rating criteria were put into the evaluation matrix (Table 2). Green spaces were arranged according to the site area, starting from the largest and then compared by the acquired values in two scales – ecology and aesthetics, creating a graphical connection (Fig. 6).

In assessment by the criterion of 'Particularity', highest scores were granted to territories with cultural and historical architecture heritage and other important monuments (Park of Jelgava Palace, Park of Valdeka Palace). Highest scores of the 'Quality of man-made elements' and 'Visible human intention' characterized the parks landscaped recently and regularly maintained historical objects, while the lower ratings of these criteria were given to abandoned and unused parks. The 'Use of outlandish' species was the opposite to the rating of 'Native species'. The maximum score got historical parks, which were historically designed as landscape parks with a variety of exotic plant species. Similarly, the highest rating scored parks were with a variety of flowers planted, because the greater part of the flower species is not of local origin. In the ecological criterion of 'Native species', highest scores earned unmanaged parks, because plants of non-native species disappear over time in these parks, but indigenous trees and shrubs remain. The criterion 'Wilderness' was considered opposite to the 'Visible human intention'. However, in certain areas, where landscape wilderness is kept by human effort, the principle of 'Visible stewardship' appeared (Raina Park, Liepaja). The 'Biodiversity' scores were higher in parks with the use of different plant species and types – trees, shrubs,

Table 2. Fragment of assessment of landscape ecological aesthetics

Green spaces		Aesthetics					Ecology						
		Order, regularity	Quality of man-made elements	Visible human intention	Particularity	Use of outlandish species	Accordance with architecture	Biodiversity	Accordance with landscape type	Native species	Naturalness	Wildlife	Carelessness, Wilderness
Parks	Jurmals Park, Liepaja	4	4	5	5	5	5	5	4	2	3	3	2
	Raina Park, Liepaja	3	4	3	4	4	4	3	4	2	4	4	3
	Park of Dunikas Street, Liepaja	2	3	2	2	1	3	2	5	3	5	4	5
	Karostas Park, Liepaja	1	3	1	2	2	2	2	3	3	4	4	4
	Stacijas Park, Jelgava	4	3	4	3	5	3	4	3	2	4	3	2
	Janparks, Valmiera	1	3	1	2	1	2	2	4	4	5	5	5
	Park of Ventspils Street, Liepaja	3	3	3	2	1	3	1	4	2	4	3	3
	Park of Jelgava Palace, Jelgava	4	3	5	5	5	3	5	3	2	4	3	3
	Raina Park, Jelgava	4	4	4	4	5	3	4	4	2	4	3	2
	Vecpuišu Park, Valmiera	3	2	3	3	2	2	2	3	3	3	2	2
	Park of Valdeka Palace, Jelgava	2	3	2	5	5	1	3	3	3	5	4	4
	Festivala Park, Rezekne	-	-	-	3	1	3	1	3	3	3	2	2
	Uzvaras Park, Jelgava	4	5	5	3	4	1	3	3	2	2	2	1
	J. Rainis Park, Rezekne	3	2	4	2	2	2	2	3	2	3	2	2
	A.Alunana Park, Jelgava	4	3	2	4	4	3	3	4	2	4	3	3

Source: created by the author

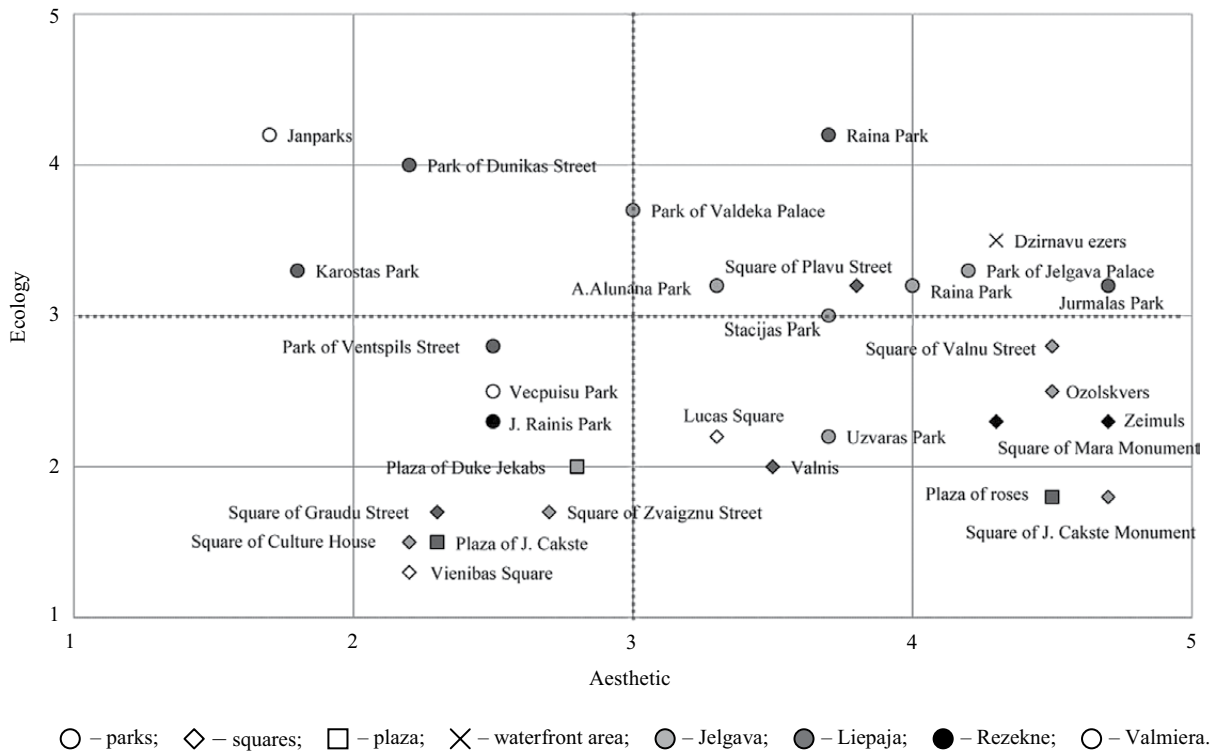


Fig. 6. Graphical connection between ecology and aesthetics of the selected green spaces.

Source: created by the author

annuals and perennials. The 'Naturalness' was typical for landscaped parks where groups of plants were more significant than man-made elements. Abandoned parks also looked more natural (Janparks, Valmiera). The 'Accordance with landscape type' in all parks was up to average, but Park of Dunikas Street was found located next to Perkones channel and it was very consistent with the adjacent natural areas - waterfront, meadows and wood. Most of the parks were located in the city centre and appropriate to the urban landscape. The Criterion of 'Wildlife' was higher if green space was farther from the city centre and more abandoned.

Results of the square analysis were similar, but diversity of plant species and biodiversity declining due to the small size of territory. Different from the rest was the Square of Plavu Street in Liepaja as it was created by people's initiative in a residential area of private houses. It consists of a lawn, pond and planted ornamental plants. Several of the analyzed squares were obsolete, with retained the Soviet-era designs. This had a negative impact on both the aesthetic and ecological criteria.

The analysis of plazas showed that the wide area of hard groundcover and spatial function was decreasing ecological values. However, the artful improvement contributed to the aesthetic values – 'Order', 'Quality of man made elements' and 'Visible human intention'. Waterfront areas were found somewhere between natural and man-made areas, because of watercourse banks and safe design for walking and cycling.

#### *Comparison of Green Spaces in Different Cities*

Comparison of evaluated green spaces showed the current usage level of landscape ecological aesthetics in four selected cities (Fig. 6). Green areas can be divided into four groups: green spaces with high ecological values (1), green areas with low ecological and low aesthetical values (2), areas with high aesthetical values (3) and green spaces with high both values (4).

Green spaces with high ecological values were natural abandoned parks of Liepaja and Valmiera. There some improvements of small architecture forms – natural made benches and hard groundcover, and use of native plants for shrubs and wildflowers should be made. Squares, parks and plazas with design from the Soviet period were found of average ecological and aesthetical values. These areas had a need for new spatial improvements with a modern design and diversity of native plant species. This type of green areas was located in most of Latvian towns.

Green areas with high quality of aesthetics were mostly different squares and plazas, where the involvement of

the ecological value was limited. Environmental quality can be provided through the diversity of native vegetation (wildflower plantings) and maintenance of separate site fragments for the visible stewardship principle. This group included a large part of new green spaces of Jelgava and Rezekne. Other green areas in Rezekne, where the development work is not yet completed, will join this group in the nearest future. Balanced areas with high level of both ecological and aesthetic values were found located in Jelgava – 5 areas in total. However, the highest values were detected in parks of Liepaja (Raina Park and Jurmalas Park). Both of these parks had large areas in comparison to the other parks analyzed. The only waterfront area assessed (Dzirnavu ezers) also fitted into this high-end aesthetic and ecological landscape group.

#### **Conclusions**

1. The main purpose of the research has been achieved by assessment and comparison of the selected green spaces. Each of the four selected Latvian cities has areas with low values of landscape ecological aesthetics and green areas with high aesthetical values. Areas with both supreme values are green spaces with regular maintenance system running from the historic time.
2. The highest ecological values were found in parks, which were left for human unaffected nature processes. The lowest ecological aesthetics values had squares and plazas with outdated and non-functional planning design. Low ecological and high aesthetical values had squares, parks and plazas with recent improvements or regular renewal of old materials and elements.
3. Each of the analyzed cities has to carry out some improvements of green spaces, which are in the lowest group of both values. Questions and solutions of landscape ecological aesthetics should be included in urban spatial plans and development programmes. The planning of urban areas is mostly influenced by the local municipal territorial planning, and it must cover the regulations and measures for green areas. The current situation and further management of different types of green spaces require to be integrated in urban development programme.

#### **Acknowledgments**

This article has been developed with support of European Regional Development Fund project "Popularization of LLU Scientific Activity", agreement No. 2010/0198/2DP/2.1.1.2.0/10/APIA/VIAA/020.

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## LATVIJOS DIDŽIŅŪ MIESTŪ ŽALIŅŪ ERDVIŪ KRAŠTOVAIZDŽIO EKOLOGINĒS ESTETIKOS VERTINIMAS

M. Jankevica

Santrauka

Pastaruoju metu Latvijojē vyksta intensyvus urbanizācijas ir gyventojų migrācijas iš kaimo vietovių į didžiuosius miestus procesas. Žalieji plotai miestų teritorijose ilgainiui traukiasi, todėl svarbu išlaikyti esamą žaliųjų plotų sistemą ir sukurti naują ekosistemą, kuri sujungtų esamus plotus. Šiuo metu Latvijojē kraštovaizdžio ekologijos ir estetikos principai ne visuomet įtraukiami į miestų ar kraštovaizdžio planavimo projektus. Studijos tikslas – įvertinti keturių Latvijos miestų – Liepojos, Jelgavos, Rezeknės ir Valmieros žaliųjų plotų kraštovaizdžio ekologines estetines charakteristikas. Vertinta pagal šiuos kraštovaizdžio estetikos kriterijus: tvarka, atitiktis architektūrai, akivaizdus humaniškumas, išskirtinumas; taip pat pagal šiuos kraštovaizdžio ekologijos kriterijus: biologinė įvairovė, vietinių rūšių dominavimas, natūralumas, laisvumas. Tyrime įvertinti įvairūs miesto žalieji plotai: parkai, aikštės ir krantinės.

**Reikšminiai žodžiai:** kraštovaizdžio estetika, kraštovaizdžio ekologija, miestų ekosistemos, žalieji plotai, kraštovaizdžio architektūra, Latvija.