LANDSCAPE ARCHITECTURE AND ART

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INTRODUCTION

The new edition of the journal overviews the research results carried out over the past half-year that are included in the doctoral and master's theses and in the work of the international seminars organized by the Latvia University of Agriculture.

Despite the enormous scale and pace of impact of modern humans on the environment, the landscapes that are not well comprehended by the contemporary society and the research community still exist. Symposia, experimental gardens of exhibitions and garden festivals are becoming very popular, being the start point of a new understanding of the perception of the green recreational landscape space and, generally, drawing public attention to the processes of conservation of the natural environment.

This also applies to the aesthetic and ecological planning of cities in Latvia. It is included in the doctoral thesis (Dr. arch. M. Veinberga), which was defended in June of this year, summarizing the research on parks and squares. The materials included in the doctoral thesis show once again that the green areas form a significant part of the urban space, serving not only for recreation, but also pointing to a high-quality ecological level of the living space.

In the research published, the landscape architect as the visual mediator provides information, highlighting the effects of the landscape space, but mocking up the unacceptable ones. Due to the rapid social changes, it is very difficult to implement the long-term design strategy nowadays, therefore new solutions are offered in theory, practice and experimental work.

Overview of the results is continued in the cultural and historical research, touching the landscape of places of worship of the Vidzeme coast, including data from the 13th century in the research. Stylistics of the wooden architecture and its context with the natural area are evaluated. The preservation opportunities of the identity of the historical heritage and landscape space in Latvia are an important indicator of the development of tourism.

Finally, a very important contribution in the field of landscape architecture is the achievements of information technology, digitally simulating and forecasting the development of the urban space and the green structures of the rural environment in the planning regions of industrial zones and agricultural areas. Digitization of the landscape space is a visually convincing way of presentation of information in municipal working groups, enabling balanced planning of economic, ecological and financial issues for the development of areas.

PRIEKŠVĀRDS

Jaunais žurnāla izdevums apkopo pēdējā pusgada pētījumu rezultātus, kas ir ietverti promocijas un maģistra darbos un Latvijas Lauksaimniecības universitātes rīkoto starptautisko semināru darbā.

Aizvien populārāki kļūst simpoziji, izstāžu eksperimentālie dārzi un dārzu festivāli, kas ir aizsākuma punkts jaunai izpratnei par zaļās rekreatīvās ainavtelpas uztveri, un kopumā vērš sabiedrības uzmanību uz dabiskās vides saglabāšanas procesiem.

Tas ir attiecināms arī uz estētisko un ekoloģisko plānošanu Latvijas pilsētās. Minētais ir ietverts promocijas darbā (Dr. arch. M. Veinberga), kas tika aizstāvēts šī gada jūnijā, apkopojot pētījumus par parkiem un skvēriem. Doktora darbā ietvertie materiāli vēlreiz skaidri apliecina, ka zaļās teritorijas veido nozīmīgu pilsēttelpas daļu, kas kalpo ne tikai rekreācijai, bet arī norāda uz dzīves telpas kvalitatīvi augstu ekoloģisko līmeni.

Publicētajos pētījumos ainavu arhitekts - kā vizuālais mediators sniedz informāciju, izceļot ainavtelpas efektus, bet nevēlamos maketējot. Ātro sociālo pārmaiņu dēļ ilgtermiņa dizaina stratēģija mūsdienās ir aizvien grūtāk realizējama, tādēļ tiek piedāvāti jauni risinājumi teorijā, praksē un eksperimentālā darbā.

Kultūrvēsturiskajā izpētē tiek turpināts rezultātu apkopojums, pieskaroties dievnamu ainavai Vidzemes piekrastē, pētījumā iekļaujot datus no 13. gs. Darbā ir izvērtēta koka arhitektūras stilistika un tās konteksts ar dabas pamatni. Vēsturiskā mantojuma un ainavtelpas identitātes saglabāšanas iespējas Latvijā ir nozīmīgs tūrisma attīstības rādītājs.

Visbeidzot, visnotaļ svarīgs pienesums ainavu arhitektūras jomā ir informācijas tehnoloģiju sasniegumi, digitāli modelējot un prognozējot gan pilsēttelpas, gan lauku vides zaļās struktūras, industriālo zonu un lauksaimniecības teritoriju attīstību plānošanas reģionos. Ainavtelpas digitalizācija ir vizuāli pārliecinošs informācijas pasniegšanas veids pašvaldību darba grupām, tā dodot iespēju sabalansēti plānot ekonomiskos, ekoloģiskos un finansiālos jautājumus teritoriju attīstībai.

Aija Ziemeļniece
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CONTENTS

Framework for understanding and analysis of rural-urban interface areas and other relatively unknown landscapes: cultural ecology perspective

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Abstract. Despite the enormous scale and pace of impact of modern humans on the environment, the landscapes that are not well comprehended by the contemporary society and the research community still exist; in this research the term "relatively unknown landscapes" was applied to define these environments including the emerging new types of landscapes, the landscapes of new complexity mainly in the areas of rural-urban interface. The aim of this research was to formulate the framework for analysis of relatively unknown landscapes. The framework is based on the hermeneutic circle that allows continuous learning and on the concept of cultural ecology, which allows understanding of landscape from human perspective and simultaneously understanding of human place in landscape. The proposed framework consists of four interrelated stages - The First Grasp (formulation of the first general impression of landscape under analysis), The Inspection of Details (testing the assumptions formulated in the first stage, filling the research gaps), The Contextualization (integration and interpretation of obtained data, comparison of landscape under analysis with different landscapes and their social contexts, communication of results and receiving feedbacks), and The Deeper Understanding (prognosis of trends, policy making, formulation of management directions, awareness raising, rethinking research focus) – and is adaptive to different natural and anthropogenic landscapes including the rural-urban interface areas, presents the possibility of gradual learning, and could be used for integration of the existing knowledge obtained using different methods.

Keywords: landscape research, relatively unknown landscapes, rural-urban interface areas, holistic approach, hermeneutic analysis, cultural ecology, integrated analysis framework.

Introduction

The 20th century and the beginning of the present century are characterized by the large-scale human environmental impacts with corresponding unprecedented landscape changes. It is even stated that no environments unaffected by humans exist on the surface of the planet [8]. However, the landscapes, environments, areas, that are not well comprehended by the contemporary society and not sufficiently analysed by the researchers, exist on the face of the planet and even in our everyday living environment - the urbanized world. We use the term "relatively unknown landscapes" to define these environments, bearing in mind that the considerable amount of data on them exists; however, they lack the comprehensive understanding and the coherent image and this makes their representation and management difficult. Generally speaking, several categories of these environments or landscapes can be distinguished:

1. The emerging landscapes characterized by newness, strangeness and can even cause senses of alienation and cognitive dissonance. Such landscapes can emerge after the radical political, social, agricultural or industrial reforms or innovations, radical economic changes etc. This category includes but is not limited to: chaotic and overgrown landscape of abandoned agricultural and industrial areas, the fringes of the shrinking cities, the cities affected by the decline of inner areas, landscapes with renewable energy production installations.

2. The landscapes of new complexity can be characterized with reference to Phillips et al. [33] as the amorphous and mobile environments. These complex, dynamic, mutable, and often fragmented landscapes often emerge in the areas of rural-urban interface, which experience a huge pressure for development.

3. The landscapes in hardly accessible, sparsely populated areas. These landscapes, if compared with the ones described above, can be characterized by relative naturalness and integrity. It is possible to say that landscapes in the unsafe areas, where long-lasting military conflicts are taking place, can be also attributed to this category as their analysis, not even mentioning the visits by tourists, raise many difficulties.

4. The contested landscapes are those that embody conflicting values and are the objects of conflicting interests. With reference to Stephenson [43], the aspects that are contested can be surface or embedded (hidden), thus the conflicting values embedded in landscapes may not be visually apparent. Contested landscapes may include the valuable cultural landscapes under pressure for development, rural landscapes affected by pressures of spatial and social urbanization, landscapes, which embody different values to different ethnic groups etc.

The European Landscape Convention [16] encourages analysing and understanding all kinds of landscapes whether they are degraded or every day landscapes or landscapes of outstanding value. In the context of provisions of the Convention the above-distinguished relatively unknown landscapes certainly deserve attention. However, another issue that justifies this research also should be mentioned: the problems regarding knowledge fragmentation and generalization in the field of landscape research. The increasing amounts of data concerning various aspects of landscapes are being gathered by different disciplines using different methodologies and approaches; According to Conrad et al. [11], numerous study fields including sociology, economics, law, philosophy, anthropology, sociology, history and design and more and more new study fields and approaches, like psychology, environmental and heritage economics, hermeneutics, and even gender studies etc. are dealing with landscapes together with such key disciplines as life/physical sciences and planning/management. They note that the increasing volume of information leads to knowledge fragmentation: "researchers are effectively 'preaching to the converted'", and mostly to those who speak their own language. There is a lack of multi-, inter-, and trans-disciplinary approaches to studying landscapes, as Ewald [17] notes. The problem of knowledge fragmentation embodies the contradictions between the modern sectorial approach to landscapes, miscommunication between disciplines and the holistic nature of landscapes. This problem also can be viewed from another angle: holistic landscape analysis models might just present a general picture, while the detailed qualitative and quantitative data might be lacking.

The aim of this research is to formulate and propose the holistic framework for analysis of above-mentioned landscapes, which would be adaptive to different natural and anthropogenic landscapes, including the dynamic and complex rural-urban areas, would present the possibility of gradual learning, and could be used for integration of existing knowledge obtained by different methods, though will not remain just a collection of unrelated sets of data. According to Stephenson [43], such integrated landscape analysis framework should enable the multiplicity of information from different sources to be seen as an interlinked whole.

Integrated approach to relatively unknown landscapes

The aim of this research was to create the model for the analysis of relatively unknown landscapes, thus for the cases then we are faced with the lack of knowledge or the separate unrelated data sets exist and the common picture has to be created and the knowledge gaps identified. This kind of model should emphasize the research processes and be based on the universal model of learning, not be limited only to provide the parallel shelves to put the existing data and the methods to obtain it. In such framework one set of data could affect the other and encourage new research: the framework should be suitable for integration of subjective and objective data starting from literature and philosophy to environmental research and economics in a way that the interaction of information could be possible. Regarding that the subject of analysis is the relatively unknown landscapes, their understanding, valuation, and management, thus the perceptible dimension, the view towards landscapes, both natural and modified by human activities, as cultural phenomena is compulsory to this model; such approach should be maintained even handling objective, quantitative, graphical data. This view can also be motivated by the idea that the preservation of nature is the act of culture. Moreover, cultural landscape studies show, that even natural landscapes can be viewed by the populations as cultural phenomena [43].

In order to coordinate and integrate the subjective and objective aspects, the culture and nature, the viewing of landscape from the different human perspectives (individual, cultural, social) and the understanding of human (individuals, groups, societies) place in landscape, the approach of cultural ecology might be useful. The association of environmental sciences and human culture into the concept of cultural ecology is allowed by the two-sided view of human nature and environment
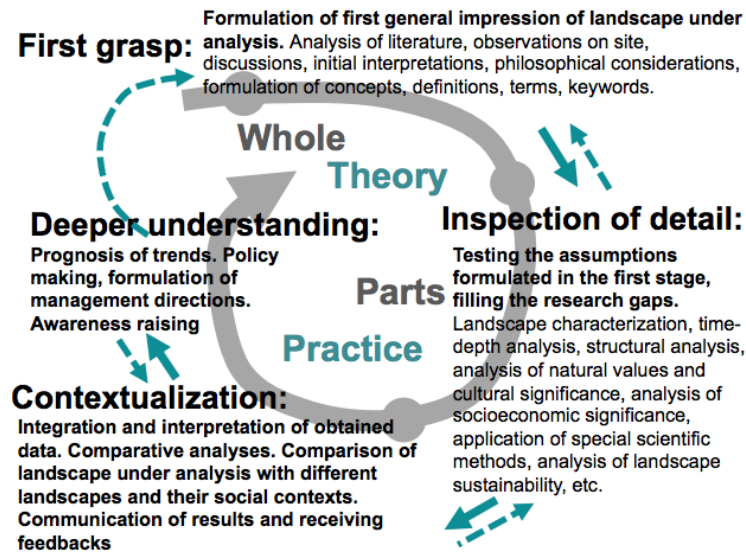
Fig. 1. Scheme of the proposed framework for understanding and analysis of relatively unknown landscapes demonstrating the process of research and its principal stages and the possible links between different sets of data [4, 23, 36, 49]

explained by von Bertalanffly: the material side is the one in which each human being lives with a physical, biological body; in the other side, according to von Bertalanffly, each person creates, uses, dominates, and is dominated by a universe of symbols [13]. Landscape is not only a set of natural forms, ecosystems, sites, buildings etc. it also refers to spiritual legacy, beliefs, and traditions. Different studies on landscape preference prove that correlation between ethnic background of landscape observer and his selected landscape as attractive and pleasant exist [24]. Conception of natural landscape is historically influenced by the human experience, traditions and cultural norms [33]. Endo [14] shows that the culture affecting the rest of the variables (international relationships and politics, science and technology, economy, industry, employment, life and society) and vice versa, that these variables affect culture; many of these interactions can be traced as the surface or embedded (hidden) aspects in landscape. According to de Bustos [13], a specific problem in one area would generate the dysfunctions in the rest. The concepts of sustainable development and sustainability also imply the links between culture and ecology. The idea of development has changed: if we state that development is supposed to be human and sustainable, then culture becomes relevant; there cannot be sustainable development without cultural sustainability, as de Bustos [13] notes. Bearing in mind the concept of cultural ecology and the need for adaptive model allowing gradual learning for landscape analysis, we have selected the hermeneutic circle as a basis for our landscape analysis framework (Figure 1). In hermeneutics our grasping of what is new in the present depends on what was already understood in the past; the historicity of human understanding is represented by the hermeneutic circle in which

a continuous flow of information prevents it from becoming a vicious circle [6]. The simplified scheme of the proposed framework for understanding and analysis of relatively unknown landscapes is presented in the figure 1 and shows how the understanding of landscape can be thought of a circular reinforcing movement: understanding is a development of what is already understood, with the more developed understanding returning to illuminate and enlarge one's starting point [23, 49], thus one set of data can affect another. Four stages in the process of analysis are distinguished: The First Grasp, The Inspection of Details, The Contextualization (meaning both physical and social contexts), and The Deeper Understanding. Below we discuss each stage of analysis in greater detail.

The First Grasp

The initial stage is aimed at formulating the first general impression of landscape under analysis. This stage of research involves the collection and analysis of various kinds of data: analysis of scientific literature, iconographic material, initial discussions with professionals and locals, the review of existing artistic work regarding the landscapes under analysis, exploring landscapes on site. For initial explorations of landscapes on site the method of overall impression can be applied. The method of overall impression is the way of landscape research, where not landscape itself but the impressions made by it are analysed, in order to understand how various people perceive landscape [29, 49]. The First grasp stage should also include the initial interpretation, philosophical considerations based on the collected knowledge and formulated impressions. For example, the Burra Charter [10] adopted in 1999 by the Australian

ICOMOS encourages the interpretation of places of cultural significance; the document proclaims that cultural significance of many places is not readily apparent, and should be explained by interpretation. The initial analysis of literature and interpretation can include the selection from various sources or even formulation of new concepts, definitions, terms, and keywords defining the relatively unknown landscape under analysis. For example, Hill [25] underlines the significance of inventing, coining new terms in a groundbreaking research or in order to promote the desirable social responses. In the paper entitled The Shock of the New Taylor & Lang [45] had selected from literature 100 new concepts describing the recent urban change and rural-urban interface, including such neologisms as penturbia, rururbia, and servurb. Traditional concepts regarding landscape perception and beauty such as picturesque, sublime, beautiful can be examined in the context of landscapes under analysis as it was done in the study by Nohl [34] as well. The result of The First grasp is the descriptive analysis. The formulated images, impressions, concepts and the useful part of the collected unprocessed data go to the following stage of the research.

The Inspection of details

The aim of the second stage of analysis - The Inspection of Details - is to test the assumptions formulated during The First Grasp analysis, to fill the detected research gaps in the general picture. The detailed information on various aspects of landscape obtained in this stage may encourage returning to the previous stage to correct or change some concepts or to move forward to the stage next stage - The Contextualization. This is the most labor intensive stage, which may include the analysis of the existing data, field research, sociological research, analysis of maps and aerial photographs, interpretation, etc. The approaches can be, though are not limited to:

Landscape characterization. This type of research focuses on the perceived character of landscape and its features. Sometimes it is referred to as visual characterization, however, others maintain that the landscape assessment should include all of the human's senses of perception (sight, hearing, touch, smell) and it is dependent on their personal experience, level of education, place of residence, traits and mood of landscape observer, and knowledge of ecological processes in landscape [5, 19, 37]. Landscape characterization methods focus on what features of landscape and of observers influence landscape preferences [49]: biophysical features of landscape, informational and functional human needs [7, 12], people's needs to understand and explore natural landscapes [36] etc. Various concepts are used

in this kind of research; for example: complexity (variety within the landscape), mystery (desire to explore), legibility (ease of finding your way around), coherence (how well does the landscape fit together: correspondence with ideal situation/harmony, unity, uniformity, land-use suitability, balance and proportion, etc.) [30]; naturalness (wilderness, vegetation health, etc.), stewardship (sense of order and care, upkeep), disturbance (intrusion, alteration, impact, lack of contextual fit, etc.), historicity (historic continuity and richness), visual scale (visibility, openness, enclosure, etc.), imageability (genius loci, sense of place, uniqueness, place identity, etc.), and ephemera (seasonal, weather changes) [48]; coziness, interestingness, mystery, coherence, impressiveness, originality, neatness, and links with the past and culture of the nation [29] as criteria for visual and aesthetic valuation of landscape. These concepts can be used for landscape description by the experts or for sociological survey of observers. Characterization may not be limited with aesthetic aspects. At the end of 20th Century the research of landscape was focusing on the question: whether visual attractive landscapes are sustainable and ecological and vice versa [19]? New theories emerged which pointed out that landscape assessment includes not only visual or aesthetic values but also ecological values. The trend of 'ecological aesthetics' includes the principles of ecology and consideration that those valuing landscape should have the ecological knowledge to describe the landscape characteristics [18]. Whereas 'aesthetics of visual stewardship' includes the criterion of visible stewardship that describes landscape as attractive in users opinion if it is well maintained and cared for [39]. In this theory natural and wild landscapes can also be seen as aesthetic and pleasant if there are visible traces of landscape management and care. There are many landscape characteristics which are useful for different landscape assessment methods from different viewpoints. However, there is a lack of combined landscape assessment methodologies that includes all aspects of landscape.

Time-depth analysis. The approaches oriented towards history are very useful understanding the development and distinguishing valuable anthropogenic and natural elements in landscapes, as many natural values remain as isolated relicts lost in the superimposed landscape structured by man in a different way, as Antrop [2] notes. According to Jacobs & Mann [28], layer upon layer of meaning is invested in the form and pattern of the landscape, as much in the city as in the country. Thus the information regarding the presence and visibility of historic character in all parts of the landscape provides an important tool [14].
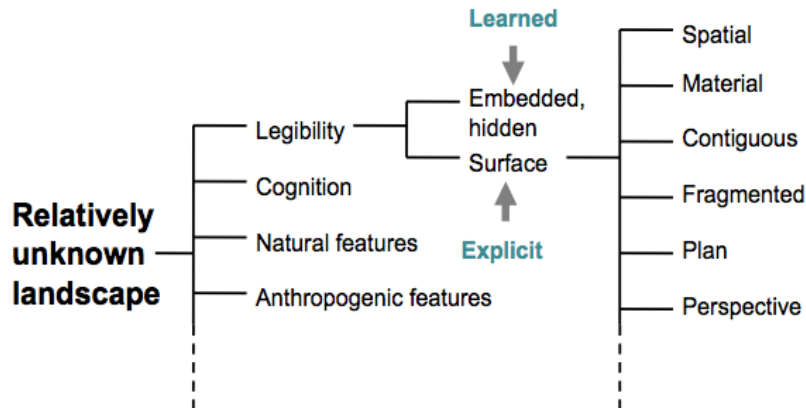
Fig. 2. Time-depth of landscape and its present legibility [14, 43]

The methodology of Historic Landscape Characterization [26] contemporarily applied in the United Kingdom is used for organically evolved rural landscapes, however Dobson [14] has analysed the possibilities of its application in urban environment. Historic Landscape Characterization projects produce interactive GIS-based descriptions of the historic dimension - the time-depth (Fig. 2) - that characterizes the analysed landscape. Time-depth projects find ways to identify the historic depth of the present day landscape from morphological analysis, general understanding or extrapolation [1]. Even if this description methodology seems past-oriented, one of the principles of Historic Landscape Characterization is "present not the past": it is the present day landscape that is the main object of the study [42].

Structural analysis of landscape. Here landscape is evaluated according to indicators of its structure – type, quantity of the components and elements and relations between them [49]. Structural analysis, which is an expert-based approach, transforms landscapes into formal design parameters through the classification of landscapes biophysical features (geomorphologic forms, vegetation, water, etc.) into characteristics which are considered to be important for landscape aesthetics i.e. forms, lines, textures, colours, and the relationships between these features, e.g. variety, vividness, unity, harmony [9, 12, 49]. Structural analysis might include both physical tangible and visible elements and intangible characteristics and functions: values (names of places, stories and meanings, sense of community, local distinctiveness, etc.), webs (grids) (water networks, distinctive pattern of settlements, etc.), spatial aspects (landforms, quality of light, etc.), nodes (towns, homestead and farming buildings, church, post office, etc.), networks (walking tracks, etc.), features (old trees, archaeological sites, scattered cottages, sheds, etc.), activities [40, 41]. Stephenson [43] also distinguishes forms, practices

and relationships as the categories of landscape analysis and their interaction over time.

To understand patterns of both natural and man-made or transformed shapes or elements in landscape special scientific methods (for example, fractal analysis, method developed by Salingaros etc.) can be used as well. These methods are useful because they relate environmental features with human perception of the environment and its cognitive aspects [49].

Environmental analysis /analysis of natural values in landscape. This aspect of detailed landscape analysis is intended to integrate various objective environmental, ecological, landscape ecology approaches. These might be the analysis of specific floral and faunal species (including aspects, such as productivity, behaviour and movements) and ecosystem/nutrient/sediment dynamics [11], also the identification of the threats, the consequences of human interventions or different uses. Aerial photographs and GIS are usual tools for such analysis. Landscape ecology, as an applied science, can play an important role in addressing today's major conservation and land-use issues and in developing responses to the pressing problems arising as a result of human-induced global change [11]. Landscape studies in ecology are based on the ecosystem services, which characterize multifunctional landscape [31]. Nowadays functionality of different landscapes is very important by taking in to account the increase of anthropogenic load and lack of natural green areas. Multifunctional landscape should provide performance of more than one category of ecosystem services (provisioning, regulating, supporting and cultural). The analysis of natural values can be linked with cultural values analysis. The elements or areas of outstanding environmental significance can be identified in this stage as the natural objects having potential cultural significance.

Analysis of cultural significance. The analysis of cultural significance is usually qualitative, descriptive analysis, however, it can involve such methods as observation on site, architectural, historical and other scientific analysis, statistical analysis, critical evaluation, and sociological research. Several approaches towards eliciting cultural significance can be mentioned. The Burra Charter [10] provides the guidance for the conservation and management of places of cultural significance. The approach towards cultural significance presented in the Charter is applied towards contested cultural landscapes of Australia and thus can be suitable in this case as well. Document underlines that the co-existence of cultural values should be recognized, respected and encouraged, especially in the cases where they conflict. Cultural significance here means aesthetic, historic, scientific, social or spiritual value for past, present or future generations; it is embodied in the place itself, its fabric, setting, use, associations, meanings, records, related places and related objects. The Charter also distinguished the categories of associations and meanings that are important for understanding the cultural significance of the place: associations mean the special connections that exist between people and a place (social or spiritual values and cultural responsibilities for a place); meanings denote what a place signifies, indicates, evokes or expresses and generally relate to intangible aspects such as symbolic qualities and memories. Other classifications of the aspects of cultural significance also exist: aesthetic value, spiritual value, social value, historical value, symbolic value, and authenticity value [27, 46]; maturity of form and structure, rarity and representativeness, the historical connections and continuity, and the relations to context [8, 21]; the criteria for assessing historic heritage values presented in the report Sustainable Management of Historic Heritage [42] present eighteen value categories (including: archeological, architectural, technology, scientific, rarity, integrity, etc.) subdivided into three groups: physical, historic, and cultural. Historical landscapes can be evaluated according to their maintenance, management and development plans including exploration and integration of cultural and natural elements.

Analysis of socioeconomic significance. The experience of the fields of economic valuation of ecosystems and cultural goods can be useful in the socioeconomic analysis of landscape. The analysis first of all can include the description of landscape as the economic cultural good distinguishing its dimensions – public cultural good, private cultural good and merit cultural good [20]. This initial part of analysis can be based on the analysis of documents and interpretation.

The categories of economic value of the landscape under analysis can be distinguished on a similar basis. These values may include the market and non-market values. The economic values of landscape can also be classified into exchange values, use values, non-use values. The use values of landscape can be classified into direct and indirect use values. The values generated by the indirect use of landscape through publications, photographs, recordings and other sources are attributed to the subcategory of indirect use values. The direct use values can be classified into the market direct use values generated by the direct use of landscape, which brings income and profit and non-market direct use values generated by the living in the preferred environment, the direct visual or recreational use of landscape, and other direct uses, which do not bring any direct financial benefits. The category of non-use values unrelated with any direct or indirect use of landscape encompasses the existence value (the mere existence of landscape is valued), bequest value (willingness to preserve landscape for future generations), investment value (willingness to pay for a landscape because it influences the price of the real estate, for example, proximity of recreational areas, quality of view), option value (willingness to visit site in the future), and altruistic value (willingness to preserve landscape in order the others could visit it) [20]. The methods based on sociological research and existing market data, such as Hedonic Price Method, Travel Cost Method, Contingent Valuation Method can be applied to elicit these landscape values. Tourism market analysis, analysis of landscape representations can be carried out to determine the types of use values and their changes. The use and non-use values provided by the landscape under analysis to locals and visitors, to different social or ethnic groups can be compared. Historic analysis how these values had changed over time can also be useful.

Analysis of landscape sustainability. The analysis of sustainability of landscapes also provides possibility integrating cultural and ecological aspects. Initially sustainable development was seen as the priority of landscape ecology, which emphasizes the importance of local diversity and the interactions between parts of an ecological system [43]. This concept has gradually expanded and currently encompasses social, cultural, environmental, and economic spheres, in which the analysis of landscape sustainability can be carried out. In order to avoid generalized descriptions, contemporary research presents various sets of sustainability indicators for ecology, economics, society, built environment, etc. An interesting parallel can be seen with the emerging discourse on cultural sustainability and the role of landscape in
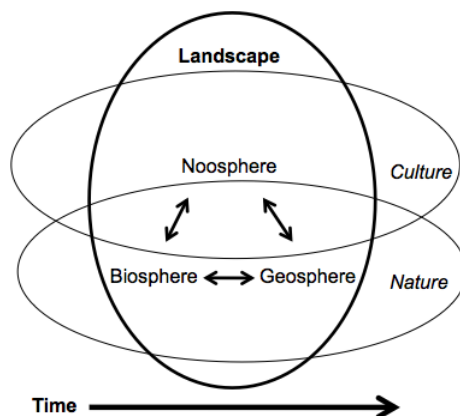
Fig. 3. Landscape model by B. Tress and G. Tress demonstrating five landscape dimensions
and their interactions over time [47]
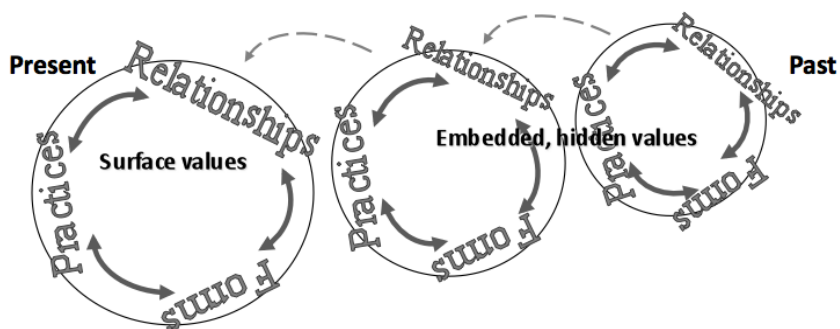
Fig. 4. Cultural Values Model by J. Stephenson for analyzing cultural landscapes showing the dynamic interaction of forms,
practices (processes) and relationships over time and surface and embedded values in landscape [43]

maintaining cultural diversity [43], as the European Landscape Convention urges to recognize landscapes as an essential component of people's surroundings, an expression of the diversity of their shared cultural and natural heritage, and a foundation of their identity. Thus the dimensions of cultural sustainability - symbolic dimension, social dimension, political dimension, cooperation dimension [13] - can be analysed in the context of landscapes. Musacchio [32] distinguishes six interrelated dimensions of landscape sustainability: aesthetics, environment, ethics, equity, experience and economy. The discussion of sustainability of all these dimensions and the analysis of weaknesses and strengths, threats and opportunities can be carried out.

The Contextualization

The results of the second stage of landscape analysis are both quantitative and qualitative descriptive data. The problem arises how to present this data in a consistent manner and to set it into context. The third stage of the research encompasses the integration and interpretation of the obtained data and setting it into physical/spatial and social context.

The analysis of literature has revealed several landscape models that can be suitable for integrating and presenting data on landscapes obtained by different methods and from different sources. For example, the model by Backhaus [3] contains four poles (Individual (Subjective pole), Culture (Symbolic pole), Society (Intersubjective pole), and Nature (Physical pole)) and six intermediate dimensions (Aesthetic, Economic, Political, Ecological, Corporeal-sensory, and Identicatory). Terkneli presented the scheme of landscape aspects; the interrelated aspects are Visual aspect (forms), Cognitive aspect (meanings), and Experiential aspect (functions) [9]. Soini also presents a three-poled model of landscape multi-functionality: landscape qualities (ecological, aesthetic, historical or symbolic characteristics), landscape functions (the services that these qualities they produce) and value systems (which determine how and why people act in the landscape) [43]. These three and other models are useful tools for gathering, and presenting the information. However, the result of using similar integrated frameworks can be a static model of significance: a map of aesthetic, historic, social, ecological and other values, where values related to nature and culture are separated from experiential and social landscape values [22, 43]. In her research on different approaches towards landscape analysis and landscape models Stephenson [44] had distinguished static and

TABLE 1

Possibilities of integration and presentation of landscape research results using
Cultural Values Model by Stephenson [22] and multidimensional landscape model by Tress & Tress [47]

	Cultural Values Model			Multidimensional landscape model				
	Forms	Practices, processes	Relationships	Spatial entity (physicalmaterial dimensio)	Mental entity (human sensory and reflective response to landscape)	Nexus of nature and culture	Complex system (involving the geosphere, biosphere and noo-sphere)	Temporal dimen-sion
First grasp: formulating the first general impression of landscape under analysis								
Initial interpretation, philosophical considerations	+	+	+	+	+	+	+	+
Method of overall impression	+	+	+	+	+	+		+
Inspection of details								
Characterization of landscapes	+	+	+	+	+	+		+
Time-depth analysis	+	+	+	+	+	+	+	+
Structural analysis of landscape	+	+	+	+	+	+	+	+
Analysis of natural values in landscape	+	+	+	+		+	+	+
Analysis of cultural significance	+	+	+	+	+	+	+	+
Analysis of socioeconomic significance	+	+	+	+	+	+		+
Analysis of landscape sustainability	+	+	+	+	+	+	+	+

dynamic, spatial and temporal approaches. According to her, dynamic-spatial-temporal model, which puts emphasis on the interactions between forms, relationships, and practices over space and time, would be the most appropriate for landscape analysis and description.

This idea reflects contemporary trends in landscape research and theory. The researchers and thinkers increasingly tend to view landscape as a system. According to Antrop [2], landscape is a complex system, which can reorganize itself so drastically that it really becomes something new. Dynamic-spatial-temporal models used for integration of data on landscapes can represent these changes. Landscape models by Tress & Tress [47] and Stephenson [43] can be potentially applied to integrate and present the data on landscapes gathered in the second stage of analysis (Table 1). Tress & Tress [47] present the transdisciplinary landscape concept (Figure 3) based on five dimensions: landscape as a spatial entity (its physical-material dimension), as a mental entity (human sensory and reflective response to landscape, the nexus of nature and culture, as a complex system (involving the geosphere, biosphere and noo-sphere), as a temporal dimension [43, 47].

The Cultural Values Model was developed by Stephenson (Fig. 4) [43] as an attempt to create "a holistic conceptual structure for considering the diversity of cultural values that might exist in any given landscape, and how these might relate to and reinforce one another". The model demonstrates the interaction of tangible and intangible landscape components over space and time. According to Stephenson [43], this model allows utilizing, combining and seeing in a new light the already available data. It allows demonstrating cultural, aesthetic, memory, meaning factors not mere energy flows.

The setting of analysed landscape into spatial context means comparing it with other landscapes: finding its analogues and opposites, determining landscape types. Both separate aspects of landscapes, or their holistic representations using the above mentioned models could be compared. The other aspect of contextualization is the communication of the research results to the scientific community, the society and receiving the feedbacks. Transdisciplinary landscape researchers try not only to coordinate scientific approaches, but also to communicate with society, which becomes part of the research process [47]. This can be done by publications, lectures, films (documentaries), exhibitions (scientific, documentary, artistic). Sociological surveys, focus groups, discussion groups, conferences can be used for receiving social feedback.

The Deeper Understanding

In the last stage of analysis we have a body of knowledge on a specific landscape set in the spatial as well as the social context. When the deeper understanding of the landscape is achieved, follows the awareness raising on previously unknown relevant issues, prognosis of possible trends of landscape development, and policy making. At this stage the research focus may be rethought and new research may be initiated. Awareness raising is closely related not only to information, but also to interpretation. According to Burra Crater [10], interpretation means all the ways of presenting the cultural significance of a place. Interpretation may be a combination of the treatment of the fabric (e.g. maintenance, restoration, reconstruction); the use of and activities at the place; and the use of introduced explanatory material. Interpretation should enhance understanding and enjoyment, and be culturally appropriate. Prognosis of landscape development trends may address cultural and environmental issues; however the model by Stephenson [43] integrating interaction of forms, practices, and relationships in landscape over a space and time, transdisciplinary model by Tress & Tress [47] or similar dynamic-spatial-temporal models can be applied not only for analysing the past and present, but also for prediction and modelling. According to Jacobs & Mann [28], securing the memories of the past is necessary to support our visions of the future. Policy making – planning and management – is concerned with environmental protection strategies, enhancement of cultural values or the integrated protection of cultural and natural values, compatible uses of landscape, landscape design, etc. As Burra Charter [10] underlines, the compatible use means the use, which respects the cultural significance of a place. Such a use involves no, or minimal, impact on the cultural significance.

Table 2 summarizes four above presented landscape analysis stages.

TABLE 2

Summary of tools, methods, and approaches that can be applied in each stage of landscape analysis
[Source: construction by authors]

Approach	Methods	Data sources	Type of results
Stage 1: The First Grasp: formulating the first general impression of landscape under analysis			
Initial interpretation, philosophical considerations	Analysis of scientific literature, iconographic material, initial discussions with professionals and locals, the review of existing artistic work regarding the landscapes under analysis, etc.	Publications, documents, artistic work, professionals, local communities, visitors, etc.	Qualitative
Method of overall impression	Exploring landscapes on site	Experiences, impressions on site	Qualitative
Stage 2: The Inspection of Details			
Characterization of landscape	Landscape description based on predefined criteria, application of concept of preferred landscape	Experiences, impressions on site, maps and other documents, professionals, local communities, visitors etc.	Qualitative and quantitative
Time-depth analysis	Historic Landscape Characterization methodology or similar approaches	Experiences, impressions on site, historical maps and documents, professionals, local communities, etc.	Qualitative and quantitative
Structural analysis of landscape	Distinguishing structural landscape components, such as nodes, networks, spaces, etc., elements, analyzing the links between them	Experiences, impressions on site, maps and other documents, professionals, local communities, visitors, etc.	Qualitative and quantitative
Analysis of natural values in landscape	Environmental valuation techniques	Data obtained during analysis on site, aerial photographs, maps, databases, etc.	Qualitative and quantitative
Analysis of cultural significance	Analysis of aspects of cultural significance, such as aesthetic, historic, scientific, social or spiritual values	Experiences, impressions on site, maps and other documents, professionals, local communities, visitors, etc.	Qualitative
Analysis of socioeconomic significance	Application of market and non-market valuation techniques	Professionals, communities, visitors, available market data, documents, etc.	Quantitative and qualitative
Analysis of landscape sustainability	Analysing landscape sustainability in different dimensions: social, cultural, economic, environmental.	Data obtained during analysis on site, aerial photographs, maps, documents, databases,	Qualitative and quantitative

Approach	Methods	Data sources	Type of results
	Sustainability indicators can be applied, SWOT analysis	professionals, communities, visitors, etc.	
Stage 3: The Contextualization: integration, interpretation of obtained data, its spatial and social contextualization			
Integration and interpretation of obtained data	Dynamic-spatial-temporal landscape models	Data obtained in previous research stages, interpretation	Quantitative
Comparison	Comparative analysis	Data obtained in previous research stages and similar data on other landscapes, with which the landscape under analysis is compared	Qualitative and quantitative
Communication of results	Lectures, discussions, publications, films, exhibitions, internet sites, etc.	Data obtained in previous research, interpretation	Qualitative and quantitative
Receiving feedbacks from society	Discussions, sociological surveys	Society, local communities, visitors, etc.	Qualitative
Stage 4: The Deeper Understanding			
Prognosis of trends	Dynamic-spatial-temporal landscape models, analysis, systematization	Obtained in previous research and constantly renewed data, interpretation	Qualitative and quantitative
Policy making	Strategies, plans, projects	Obtained in previous research and constantly renewed data, interpretation	Qualitative and quantitative
Awareness raising	Lectures, discussions, publications, films, exhibitions, internet sites, etc.	Obtained in previous research and constantly renewed data, interpretation	Qualitative
Rethinking research focus	Discussions, analysis, systematization, synthesis of the research results	Obtained in previous research and constantly renewed data, interpretation	Qualitative
Rethinking or redeveloping the aspects of the methodology	Discussions, analysis, systematization, synthesis of the research results	Obtained in previous research and constantly renewed data, interpretation	Qualitative

Conclusions

1. The scientific novelty of the research lies in the development and characterization of the concept of the relatively unknown landscape applicable to the areas of rural-urban interface among other types of landscape and the integrative approach based on hermeneutics and cultural ecology towards the gradual accumulation, analysis and presentation of data regarding these landscapes.

2. Four categories of relatively unknown landscapes were distinguished in this research: the landscapes that emerge after the radical political, social, agricultural or industrial reforms or innovations, radical economic changes etc., so-called emerging landscapes; the complex, dynamic, mutable, and often fragmented landscapes that often emerge in the areas of rural-urban interface experiencing huge pressure for development, so-called landscapes of new complexity; the landscapes in hardly accessible, sparsely populated areas; the contested landscapes embodying conflicting values. The characterization of relatively unknown landscapes allows concluding that the complex, contested, dynamic rural-urban interface areas are the relatively unknown landscapes par excellence.

3. The considerable amount of fragmented data on such relatively known environments usually exists, however, they lack comprehensive understanding and coherent image and this makes their representation and management difficult. The research has demonstrated that the cultural ecology approach allowing the gradual learning and the integration of data into dynamic-spatial-temporal [43] models is appropriate for relatively-unknown landscapes including rural-urban interface areas.

4. The proposed hermeneutic circle based framework for analysis and understanding of relatively unknown landscapes consists of four interrelated stages: The First grasp aimed at formulation of the first general impression of landscape, it includes the analysis of literature, observations on site, discussions, initial interpretations, philosophical considerations, formulation of concepts, definitions, terms, keywords, etc., The Inspection of Details stage is aimed at testing the assumptions formulated in the first stage and filling the research gaps, this stage may include landscape characterization, time-depth analysis, structural analysis, analysis of natural

values and cultural significance, analysis of socioeconomic significance, application of special scientific methods, analysis of landscape sustainability, etc.; The Contextualization stage is aimed at integration and interpretation of obtained data, comparison of landscape under analysis with different landscapes and their social contexts, communication of results and receiving feedbacks; The Deeper Understanding is aimed at the prognosis of trends, policy making, formulation of management directions, awareness raising, rethinking the research focus.

5. The benefits of the developed approach lie in that the analysis of landscape in this circular reinforcing movement is adaptive to different natural and anthropogenic landscapes including the areas of rural-urban interface, presents the possibility of gradual learning, and could be used for integration of existing knowledge obtained by different methods. The research has showed that the approach applied in hermeneutics can be successfully applied in landscape analysis as well. The potential disadvantages of the approach may be related with the large volumes of diverse data that can be potentially integrated using the developed model and the concise and clear presentation of the research results. The future research might include the practical application of the approach to different types of landscapes including the areas of rural-urban interface and the more detailed elaboration of the separate aspects of the overall model.

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Kopsavilkums. 20. un 21. gadsimtu raksturo plaša mēroga cilvēka ietekme uz vidi un ainavu, kas izraisa dažādas neparedzamas un iepriekš nepieredzētas izmaiņas ainavā. Tiek uzskatīts, ka uz planētas vairs nepastāv vide, ko nebūtu skārusi mazāka vai lielāka cilvēka ietekme. Tomēr mūsdienās joprojām pastāv ainavas, kas mūsdienu sabiedrībā un ainavas pētnieku aprindās nav līdz galam izpētītas un izprastas. Šajā pētījumā termins "relatīvi nepazīstamas ainavas" tika piemērots, lai definētu šādu vidi, piemēram, jauna veida ainavas, jaunas kompleksas ainavas, kas galvenokārt veidojas kā lauku un pilsētu mijiedarbības zonas, grūti pieejamas mazapdzīvotas ainavas un diskutablās ainavas. Šī pētījuma galvenais mērķis bija formulēt zinātniski metodisko pamatojumu relatīvi nepazīstamu ainavu analīzei un izpētei.

Pētījumā izveidotā sistēma balstās uz hermeneitikas apli, kas iekļauj nepārtrauktu mācīšanos un kultūras ekoloģijas jēdzienu - izprast ainavu no cilvēka perspektīvas, vienlaicīgi veicinot izpratni par cilvēka vietu ainavā. Piedāvātā sistēma sastāv no četriem savstarpēji saistītiem posmiem - Pirmais iespaids (pirmā vispārējā analizētās ainavas iespaida formulēšana), Detalizēta izpēte (pirmajā posmā formulēto pieņēmumus pārbaude, aizpildot robus esošajās zināšanās par analizēto ainavu), Kontekstualizācija (iegūto datu integrācija un interpretācija, analizētās ainavas salīdzināšana ar citām ainavām un to sociālo kontekstu, rezultātu apspriešana) un Dziļāka izpratne (tendenču prognozēšana, politikas veidošana, pārvaldības virzienu formulēšana, izpratnes veicināšanu, pētījuma fokusa pārskatīšana) - un tā ir pielāgojama dažādu dabisku un antropogēnu ainavu izpētei, tostarp pilsētu-lauku mijiedarbības teritorijās, tā piedāvā pakāpeniskas mācīšanās iespēju, un to var izmantot dažādu citu metožu izmantošanā iegūto esošo zināšanu integrācijā. Lai koordinētu un integrētu subjektīvos un objektīvos aspektus, kultūru un dabu, ainavas izpēti no dažādām cilvēka perspektīvām (individuālā, kultūras, sociālā) un izpratni par cilvēka (indivīda, grupu, biedrību) vietu ainavā, tiek izmantota kultūras ekoloģijas pieeja. Ainavas detalizētā izpētē tiek izmantotas ainavas raksturojuma, ainavas laika-dziļuma analīzes, ainavas struktūras analīzes, vides analīzes/ainavas dabas vērtību analīzes, kultūras nozīmīguma analīzes, socio-ekonomisko aspektu nozīmīguma analīzes un ainavas ilgtspējas analīzes metodes.

Pētījuma rezultātā tika izdalītas četras relatīvi nepazīstamu ainavu kategorijas: jaunās ainavas, kas radušās radikālu politisku, sociālu, lauksaimniecības vai rūpniecības reformu vai inovāciju, radikālu ekonomisko izmaiņu rezultātā; jaunās kompleksās ainavas, kas ir sarežģītas, dinamiskas, mainīgas, un bieži sadrumstalotas ainavas, kas parādās lauku un pilsētu mijiedarbības zonās un saistītas augstu attīstības spiedienu; ainavas, kas atrodas grūti pieejamās mazapdzīvotās vietās; un diskutablās ainavas, ko raksturo dažādas pretrunīgas vērtības vai konfliktējošus objektus. Veiktais pētījums norādīja, ka kultūras ekoloģijas pieeja, izmantojot iegūto datu integrāciju dinamiskos telpas-laika modeļos, ir piemērota relatīvi nepazīstamu ainavu izpētei.

Power and Water Resources of Arid Landscapes

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Abstract. Why the transmission lines of electric infrastructure are so important compared to the network of water supply? How can we restore the natural balance? If cyberspace did not exist without electricity, humanity could not survive without water. It is possible to take advantage of using electric grid for helping improve water resources. Transmission towers' structure with an additional structural reinforcement could provide support to a network of artificial clouds made of light galvanized steel bars and strings, nebulizers system and silver iodide canyons. Under these clouds there are closed and open water reservoirs with shade balls depending on topography, climate and soil conditions and they are connected from mountains to the city. Electric lines are much like water pipes. In the case of transmission lines, the higher the voltage, the more electricity that can be transmitted, just like a wide water pipe can carry a larger volume of water. Electrical transmission lines operate at high voltages and carry large amounts of electricity over long distances. New water networks would make use of topography, soil permeability and existing infrastructure. These micro-clouds are also important to reduce fire risk, one of the consequences of droughts. Nature's endorsement of tensegrity structures are efficient because per unit mass, spider fibber is the strongest natural fibber and these structures are transferrable from nano-to mega scale. This is a great challenge to develop scientific procedures to create smart tensegrity structures that can regulate the flux of water resources, as well as thermal, mechanical and electrical energy in a material system by proper choice of material, geometry and controls.

Keywords: Landscape Architecture; Power lines; Water storage; Sustainability: Tensegrite structures.

Introduction

1. Power transmission lines. Tower structure

Transmission towers' structure with an additional structural reinforcement could provide support to a new artificial clouds network made of light galvanized steel bars and strings, nebulizers system and silver iodide canyons. Under these clouds there are closed and open water reservoirs with shade balls depending on topography, climate and soil conditions and they are connected from mountains to the city. Electric lines are just like wide water pipes can carry a larger volume of water. Electrical transmission lines operate at high voltages and carry large amounts of electricity over long distances. Electric infrastructure is reinforced with additional water infrastructure, but it does not interfere with its day-to-day management.

The goal is to use the same topographic infrastructure and the same light structure for supporting snow canyons and for hanging micro-clouds referring to produce rain that is stored in water reservoirs covered with shade balls and connected each other by gravity. New water network would make use of topography, soil permeability and existing infrastructure.
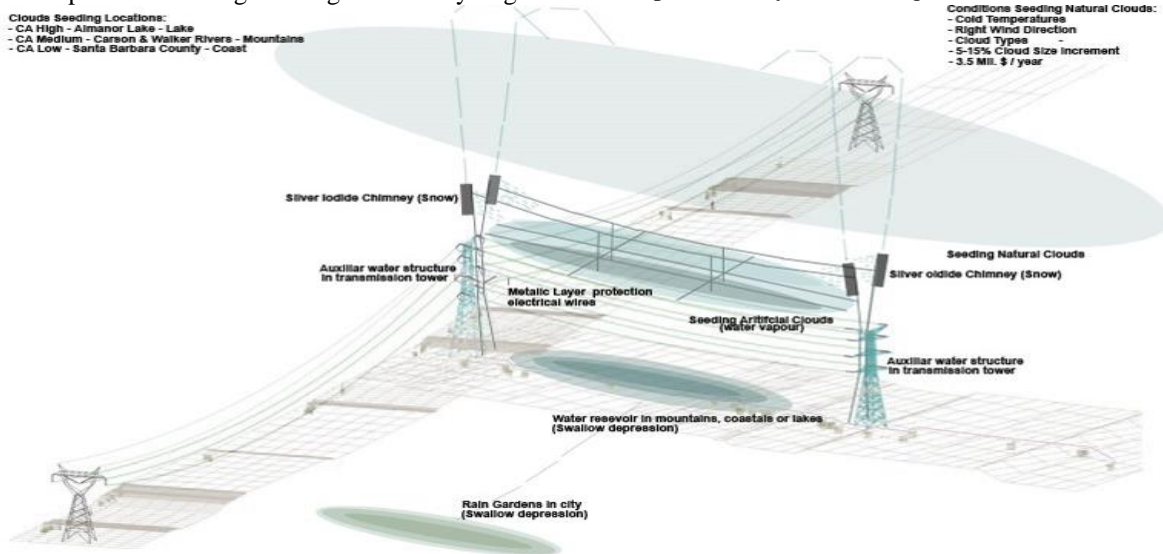

Fig. 1. Key sketch of power and water infrastructure [Source: material from author personal archive]

Fig. 2. California maps: CA1 High Richardson & Roaring
Creek, CA2 Mid Upper San; Joaquin River.,
CA3 Low Santa Barbara County, 2015
[Source: material from author personal archive]

The location of the power & water lines are:
CA1 High Richardson & Roaring Creek,
CA2 Mid Upper San Joaquin River, CA3 Low Santa
Barbara County.

Fig. 3. California major electric transmission lines, 2011
[Source: material from author personal archive]

Pacific Intertie. The Pacific DC Intertie
(also called Path 65) is an electric power
transmission line that transmits electricity from the
Pacific Northwest to the Los Angeles area
using high voltage direct current (HVDC).
The line capacity is 3,100 megawatts, which is
enough to serve two to three million Los Angeles
households and represents almost half (48.7 %)
of the Los Angeles Department of Water and
Power (LADWP) electrical system's peak capacity [1].

Future energy projects. Magnetic fields.
An interesting new paper suggests that the ritual
practice of burning parts of villages to the ground in
southern Africa had an unanticipated side-effect:
resetting the ground's magnetic data storage
potential. The ground, then, is actually an archive of
the Earth's magnetic field [2].

2. Water transmission lines. Micro-clouds structures

Water transmission surfaces. Water managers
have being exploring precipitation enhancement via
cloud seeding as alternative to augment water
resources. Clouds seeding created a way of
experimenting with supercooled clouds using a deep
freeze unit of potential agents to stimulate ice crystal
growth, i.e., salt, talcum powder, soils, dust and
various chemical agents with minor effect. In the
micro-clouds' network are employed small dust seed
chimneys located in the reinforcement of
transmission tower creating reservoirs for local use
as well as water pipelines to build infrastructure to
store and transport water to where it is needed.
The location of the power & water lines are: CA1

High Richardson: Pacific Gas & Electric Co., CA2 Mid Madison: Desert Research Institute, CA3 Low Diablo canyon Power Plant: Santa Barbara County.

Atmospheric chemistry at the University of California-San Diego (Kim Prather). On snowy days, the clouds contained dust from a faraway source. Dust had made its way across the Pacific; clear from Asia and even Africa, the Middle East where there are these big dust storms. Takes about 7-to-10 days to get to California, but it makes it. It's not a lot of dust. It's just the right amount of dust that seeds the very top of the clouds. There's only so much water available and in order to get rain, you have to have big enough droplets for them to fall. The more seeds you have, you have many more tiny droplets. If you have too many seeds, you're not going to get precipitation out of that cloud [3].

Desert Research Institute in Reno. Water needs some sort of substance to condense upon. Clouds are made of millions of tiny water droplets, but the droplets don't automatically fall as rain or snow. They stick to tiny particles like dust. Cloud seeding only works in certain conditions: cold temperatures with the right wind direction and cloud types. Even more, cloud seeding has been used for six decades in California. Across the country, water agencies and utilities spend $3-to-5 million a year on seeding. It can be one tool in the toolkit and it's a cost-effective one [4].

Future water structures. The Great Lakes region is intimately connected to one of the largest fresh water systems on Earth, a full 20 % of the world's fresh surface water. Unfortunately, this great privilege is being threatened by the leading source of water pollution: incorrect management of rain and storm water. Communities can take action against rain and snowmelt flowing off of yards, roofs, and sidewalks and washing pollution into water systems. Rain gardens are designed to collect and absorb runoff from a roof or parking lot, the way nature intends rain to soak into the soil. Even it is a way to stop evaporation over water reservoirs [5].

Future atmospheric structures. Laboratory for Atmospheres at NASA's Goddard Space Flight Centre. Dan Cziczo's team contacted NASA for samples of dust thought to be similar in composition to dust on Mars (it was actually collected from U.S. deserts) and placed them in the cloud, adjusting its temperature and relative humidity to levels that have been observed on Mars. The experiment successfully formed a water-ice cloud [6].

Future green structures. The space agency is planning to send seeds on its next Mars rover, which is scheduled to launch in mid-2020 and land on the red planet in 2021. The mission, known as the Mars Plant Experiment (MPX), aims to create a small Martian greenhouse which, if successful, could pave the way for humans living on the planet [7].
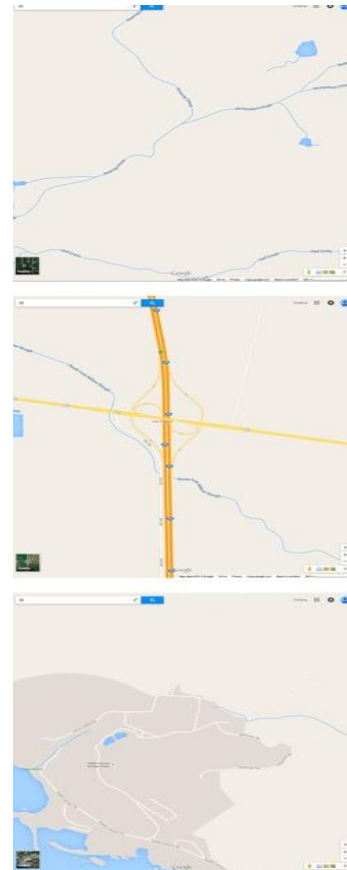

Fig. 4. California electric maps; CA1 High Richardson: Pacific Gas & Electric Co., CA2 Mid Madison: Desert Research Institute, CA3 Low Diablo canyon Power Plant: Santa Barbara County., 2015
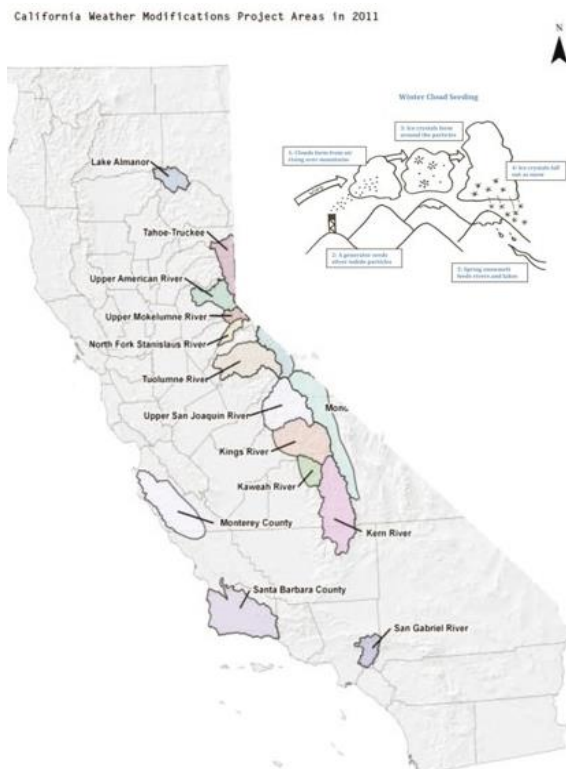[Source: material from author personal archive]

Fig. 5. California weather modifications project areas, 2011
[Source: material from author personal archive]

Research and methodology

The use of self-similar structures allows finding minimal mass subject to a specified buckling constraint. Light structure is calculated for wind and snow loads. The components of the micro-clouds structure are:

1. Reinforcement of transmission tower's structure. The same galvanized steel profiles of the original transmission tower are used in the reinforcement with dry assembly and earth connection. Micro-clouds system is hanging from prestressed strings from one tower to another.

2. Silver iodide canyon structure. Clouds seeding created a way of experimenting with supercooled clouds using a deep freeze unit of potential agents to stimulate ice crystal growth, i.e., salt, talcum powder, soils, dust and various chemical agents with minor effect. The chimney located in the reinforcement of tower structure releases tiny particles of silver iodide over the micro-clouds. The goal of iodide salt canyon is to disperse substances into the air that serve as cloud condensation or ice nuclei, which alter the microphysical processes within the cloud.

3. Micro-Cloud Structure. Tensegrity structures consist of strings (in tension) and bars (in compression). Strings are strong, light, and foldable, so these structures have the potential to be light but strong and deployable. Pretensing all strings makes its shape robust to various loading forces. The shape of a tensegrity structure can be changed substantially with little change in the potential energy of the structure.

4. Nebulizer network. Nebulizers system is incorporated over tensegrity structure each 20cm and can operate automatically by using solenoid valves and specific hydraulic station. The high-pressure of nebulizers is carried out by high-grade steel jets with tiny apertures of 120 microns in diameter, through which the water is forced at a pressure of 80 bars onto fine needle points directly above the apertures and atomised into innumerable tiny droplets 4 to 10 microns in diameter, as Blur's project.

5. Water transmission surfaces. Water managers have being exploring precipitation enhancement via cloud seeding as alternative to augment water resources. In the micro-clouds' network are employed small dust seed chimneys located in the reinforcement of transmission tower creating reservoirs such as water tanks for local use as well as water pipelines to build infrastructure to store and transport water to where it is needed.

6. Rain gardens. It is a shallow depression that is planted with deep-rooted native plants and grasses. Their characteristic are: reduces flooding and erosion, less imported water used for yard
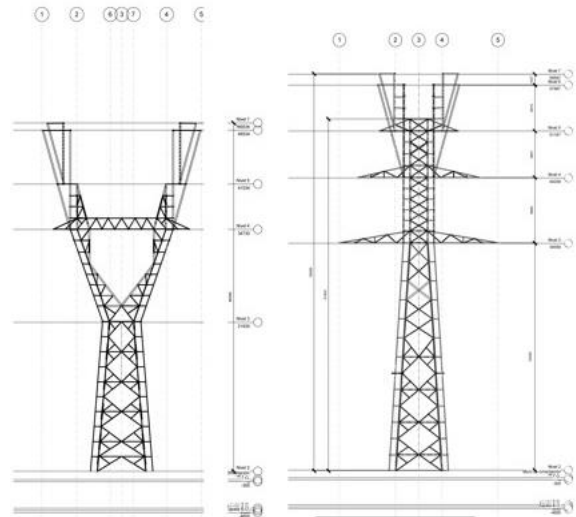

Fig. 6. Reinforcement of transmission tower's structure
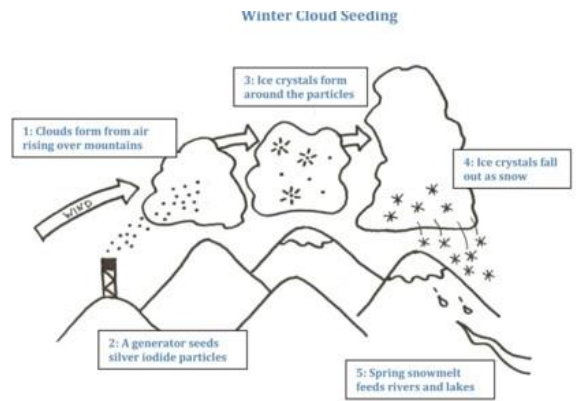[Source: material from author personal archive]

Fig. 7. Silver iodide canyon structure
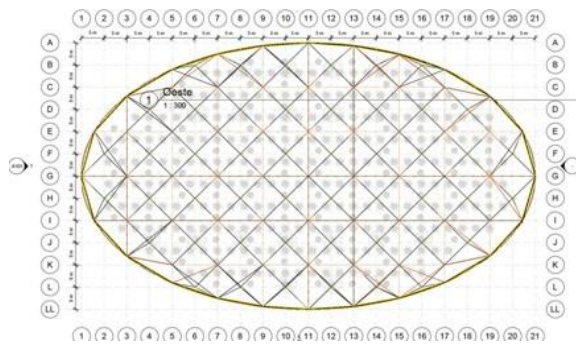[Source: material from author personal archive]

Fig. 8. Micro-Cloud Structure of Tensegrity structure
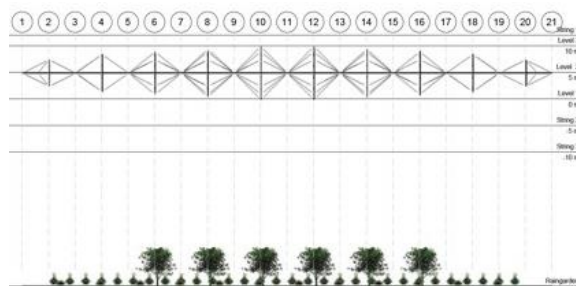[Source: material from author personal archive]

Fig. 9. Nebulizer network
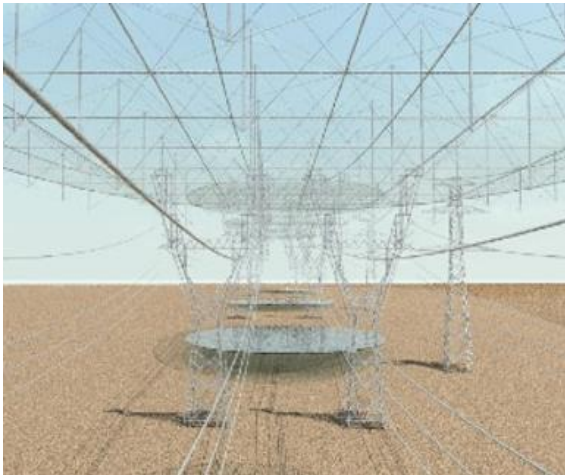[Source: material from author personal archive]

Fig. 10. Water transmission surfaces
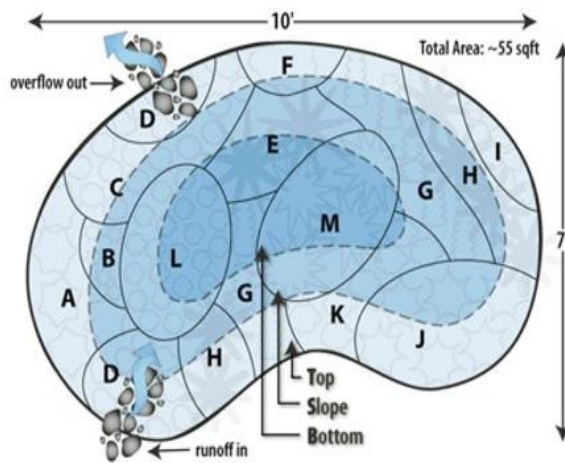[Source: material from author personal archive]

Fig. 11. Rain gardens surfaces
[Source: material from author personal archive]

irrigation, lower water bills, less polluted storm water runoff and biodiversity recovery. It is an action against rain and snowmelt flowing off of yards, roofs, and sidewalks and washing pollution into water systems. Rain gardens are designed to collect and absorb runoff from a roof or parking lot, the way nature intends rain to soak into the soil. Even it is a way to stop evaporation over water reservoirs.

To summarize, the structural elements are:

1. Pillar bars (circular hollow section ROR 101,6x10 mm).
2. Beam bars (circular hollow section ROR 219,1x10-101,6 x10 mm).
3. Strings (circular M30-50mm).
4. Nebulizers (high-grade steel jets/20cm).
5. Tower Structure Reinforcement (IPE 100-50-UPN 100).
6. Silver iodide canyons.
7. Water pressure group.
8. Water tanks (PE pond).
9. Water canals and pipelines between tanks.
10. Rainwater gardens construction.

Results and discussions

It is worth noting that there are previous researches about how to deal with light and atmospheric structures. In relation with natural resources, Patrick Geddes showed the Valley section and the purpose of his theory and understanding of relationships among the units of society was to find equilibrium among people and the environment to improve such conditions. "The valley section is a longitudinal section which begins high up in the mountains and then follows the course of a river down the mountains and through a plain toward its estuary at the coast. He expresses in the valley region that Enlightenment theory of social evolution describes mankind's development through the four stages of hunting, pastoral, and agriculture toward commercial societies" [8].

Firstly, the futurist project named "Cloud 9" of Buckminster Fuller is a floating city that uses tensegrite structures of half-mile (0.8 km) diameter. It would weigh only 1/1000 of the weigh of the air inside of it and if the internal air were heated by either solar energy or human activity inside, it would only take a one degree shift in Fahrenheit over the external temperature to make the cloud float. One of the most practical uses he proposed of them was as disaster sites for emergencies [9].

Secondly, Paul Maymont used the project named "Village vacances suspend" to explain how to recover the lost harmony with the environment by hanging cities. He created a vertical and modular stratification that allows a very high density of around 10.000 inhabitants per km2. Considering that traffic movement is a waste of time, Paul Maymont explained that suspended highways interconnected these modules [10].

In "Cité des sables", Paul Maymont studied the future of the cities in different environments with the minimal impact on them.

Thirdly, "Blur project" of Diller & Scoffidio talked about the use of recycled materials we can find in the surrounding environment such as the water of the lake. It is a fog mass resulting from Lake Neuchatel whose water is pumped, filtered and shot as a fine mist through 35,000 high-pressure nozzles. The lightweight tensegrite structure measures 300 feet long by 200 feet wide by 75 feet high and is supported by four columns [11].

Finally, environmental engineering firm Transsolar and Japanese studio Tetsuo Kondo Architects prepared an atmospheric installation called "Cloudscapes" which is created by pumping three layers of air into the space: cold dry air at the bottom, hot humid air in the middle and hot dry air at the top. They have suspended a cloud inside the Arsenal exhibition space at the Venice Architecture Biennale in 2010 [12].
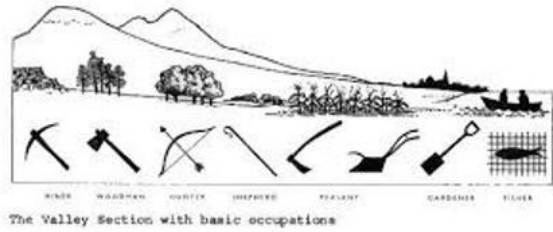
Fig. 12. Patrick Geddes. Valley Section, 1909
[Source: material from author personal archive]
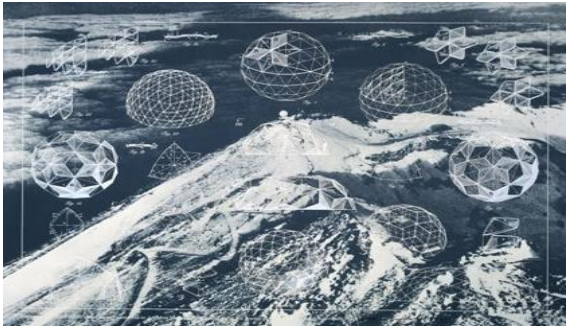
Fig. 13. Buckminster Fuller. Cloud 9.
Project for a Floating city, 1930s-1950s
[Source: material from author personal archive]
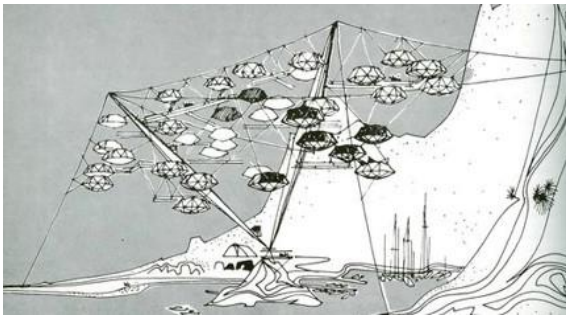
Fig. 14. Paul Maymont. Village vacances suspendu. 1960s
[Source: material from author personal archive]
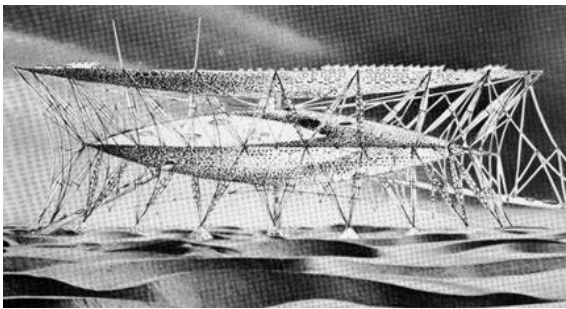
Fig. 15. Paul Maymont. Cité des sables. 1960s
[Source: material from author personal archive]
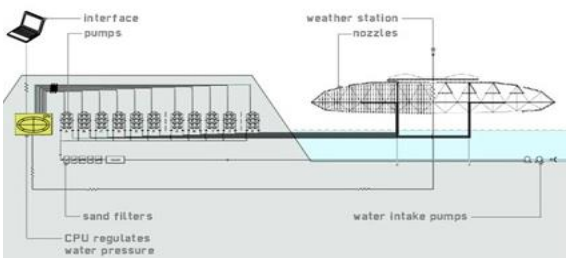
Fig. 16. Diller & Scoffidio & Renfro. Blur's project.
Expo Hannover, 2002 [4]

Fig. 17. Transsolar&Tetsuo Kondo., Bienal Venezia, 2010 [5]

Fig. 18. California maps; CA1 High Richardson & Roaring
Creek, CA2 Mid Madison, CA3 Low Diablo Canyon Nuclear
Power Plan [Source: material from author personal archive]

There will be three projects' areas: CA1 High Richardson & Roaring Creek, CA2 Mid Madison, CA3 Low Diablo Canyon Nuclear Power Plan.

These water banks create additional supply water system for local residents and transmission water surfaces connecting the whole micro water reservoirs. The initial amount of water required for nebulizers system from water reservoirs will be recovered and incremented by micro-clouds's rain caused by silver iodide canyon, which transform water vapour into snow. New water networks would profit topography.

1. *CA1 Location. Mountains (CA High).* It is a rural topography with density of scrubs and large forest.

   CA1 Climatic parameters:

   - Semi-arid Mediterranean climate.
   - Sunlight (Tmax=38ºC/TºMin=-8,0ºC).
   - Wind: Delta breeze Summer E.
   - Precipitation (470mm/year).

   CA1 Existing Water resources:

   - California aqueduct. It is part of State Water Project. It takes water from San Joaquin and Sacramento Rivers in North California to irrigate agricultural crops of Central Valley and transfer water through los Angeles;
   - Sacramento. It is the second most flood susceptible city in the United States after New Orleans.

CA1 High Richardson & Roaring Creek. The new management of aquifers is the main theme. The excessive extraction of subterranean water has left groundwater level below local vegetation's roots generating great amount of salt that is the origin of dust formation. Salinization, aquifer depletion and progressive accumulation of sediments reveal the instability of hydraulic system. Water bank could be an instrument to manage droughts. Experience acquired in emergency drought water banks in California provides certain lessons for the future development of these banks. These micro-clouds act as sprinklers grid that try to reduce dust dispersed into lakes for recovering biodiversity, at least bird's settlements. At the same time, micro-clouds' reservoirs try to increase the amount of water of subterranean aquifers.

CA1 High Richardson & Roaring Creek (Mountains) Intervention is linked with the recovery of soil permeability. Aridity extends water research along vast distances, from the melting of the glaciers in the Rocky and Sierra Morena Mountains. Runoff is stored and separated from territory to transport water through kilometric tubes and pipes to hermetic reservoirs located in the city. Topography is ignored by energy efforts such as pumping stations, which invert the decreasing field of potential energy. Water is relocated and disconnected from local topography because of
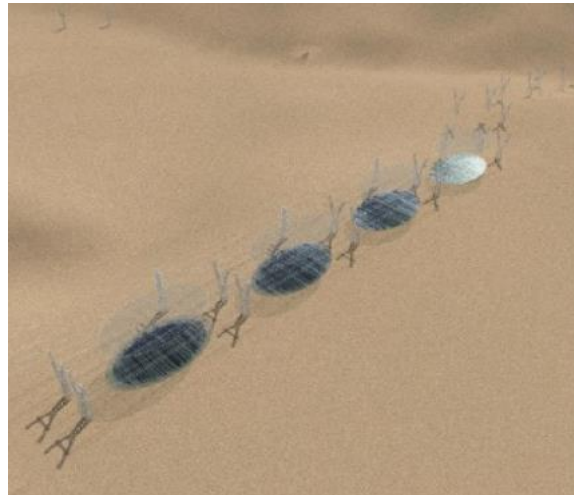
Fig. 19. Power & Water location;
CA1 High Richardson & Roaring Creek
[Source: material from author private archive]

Fig. 20. Power & Water structure;
CA1 High Richardson & Roaring Creek
[Source: material from author private archive]

pipelines' network that provides water supply and sewage, treatment plants, purifiers and the point of effluent discharge in the Pacific. For those reasons, connecting micro-clouds' reservoirs could be an alternative porous proposal to the tubes and pipes.

2. *CA2 Location. Agricultural lands (CA Mid).* It is a field where the agricultural and animal production area conditions the surroundings.

   CA2 Climatic parameters:

- Hot-summer Mediterranean climate.
- Sunlight (Tmax=48ºC/TºMin=-8,0ºC).
- Frost to December through February.
- Precipitation (845mm/year).
- Fog: December to January: Tule fog.
  CA2 Existing Water resources:
- Shasta Dam on the Sacramento River. It provides a considerable level of flood protection for Redding. The dam is capable of controlling flows up to 79,000 cubic feet (7,300 cubic meters) per second.
- Keswick Dam. Just upstream of Redding, it marks the end of the free-flowing reach of the Sacramento River. It is the highest point upstream at which salmon and steelhead spawn.

CA2 Mid Agricultural lands. The original geometry will be affected by the impacts of extreme weather events and the time of day or night; moving away from the desire to impose static order such as rigid geometric design on nature which is rare, and usually temporary, passing through the micro to the macro scale of thermodynamic /climatic parameters. Landscapes are dynamic and the result of physical processes (such as erosion and sedimentation) and biological processes (involving growth, blossoming and decay).

CA2 Mid Madison. The decentralization of engineered infrastructure must make way for practical reclamation of biophysical processes and reintegration of ecological flows, relating the macro to the micro-scale of biological studies. In the case of small biotopes, connected islands of landscape reveal the possibility of using balanced resources, which consist of the right qualities and proportions of water, drainage, minerals and electricity need to maintain growth. Biotopes networks and polycentric nodes of resources are generating live-work patterns that are increasingly distributed and dispersed.

3. CA3 Location. Coastal zones (CA Low). It is an approach to the riparian and coastal vegetation dynamics.

CA3 Climatic parameters CA Low:
- Subtropical-Mediterranean climate.
- Sunlight (Tmax=45ºC/TºMin=-4,0ºC).
- Wind: Santa Ana winds (Wild fire risk).
  CA3 Existing Water resources CA Low:
- Los Angeles Aqueduct, 1913. It is the first built as part of State Water Project. It takes water from Owens River in East Sierra Nevada Mountains through north California. It has 359km length and 3,7m diameter and 2 hydroelectric plants. It is extended 220km in 1940.
- Colorado River Aqueduct, 1941. It takes water from Lake Havasu in Arizona, along 390 km.
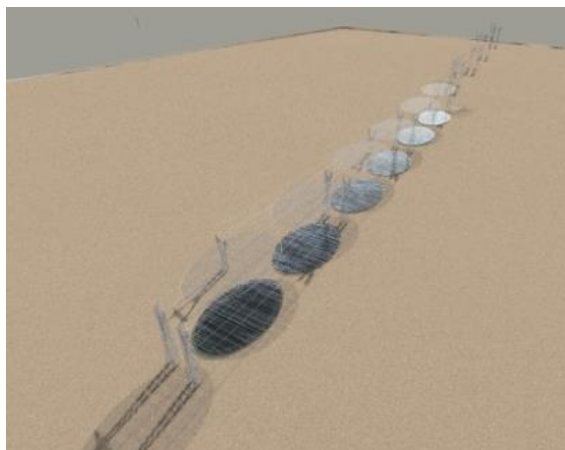
Fig. 21. Power & Water location; CA2 Location.
Agricultural lands (CA Mid)
[Source: material from author private archive]
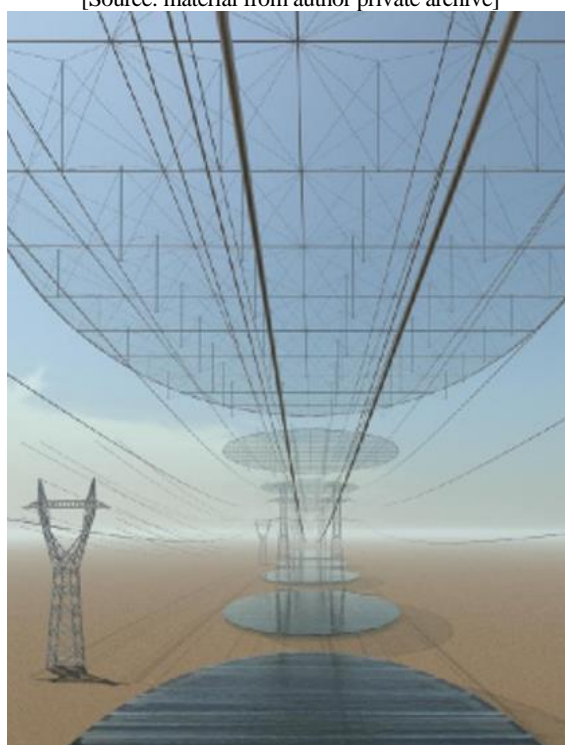
Fig. 22. Power & Water structure;
CA2 Location. Agricultural lands (CA Mid)
[Source: material from author private archive]
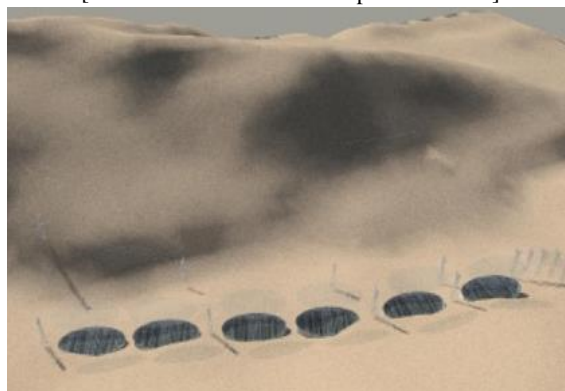
Fig. 23. Power & Water location;
CA3 Location. Coastal zones (CA Low)
[Source: material from author private archive]
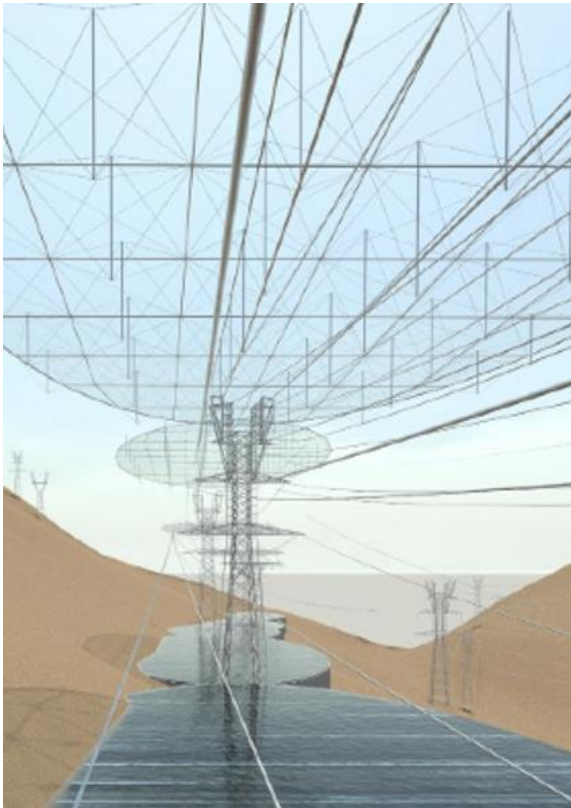
Fig. 24. Power & Water structure; CA3 Location.
Coastal zones (CA Low)
[Source: material from author private archive]
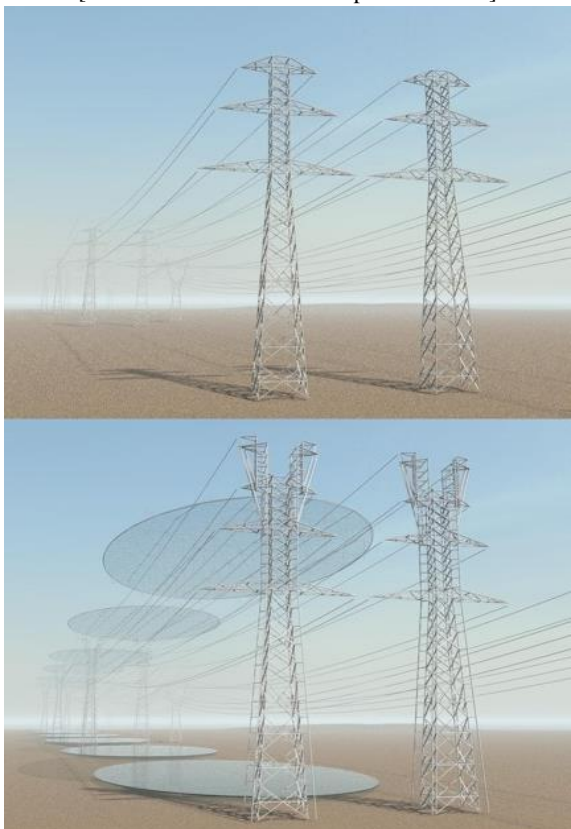
Fig. 25. Power & Water resources project without and with
reinforcement structure
[Source: material from author private archive]

The aqueduct raise water 492 m by 5 water pumping stadions;

- Hoover Dam, 1936. It is made possible the development of California, Nevada, Utah y Arizona.
- Los Angeles microclimate. This area is also subject to phenomena typical of a microclimate, causing extreme variations in temperature in close physical proximity to each other.
- El Niño. Wet years are usually associated with warm water El Niño conditions in the Pacific, dry years with cooler water La Niña episode.

CA3 Low Coast zones. The multiple non-electric applications of nuclear energy and cogeneration allow to visualize new topographies which are small landform buildings with large areas of production: salt fields, water desalination plants, hydrogen generators, transport research centres (airdromes, ship propulsion, nuclear submarines, supply spacecraft energy), district heating, and natural reserve centres.

- Mounds as inclined platforms were the initial human response to flooding by artificial reefs, which have long been used to reduce wave height and dissipate the waves energy.
- Voids are also used for coastal adaptation to make more room for floodwaters.
- Islands are artificial surfaces that are designed to move, pushed along by waves, growing vertically by sediment or floating like dynamic landforms.

CA Low Diablo Canyon Power Plant. How can we use and protect the value of the landscape that surrounds a nuclear power station located closer to oceans or rivers by several safety protection cycles? Rivers and oceans are multi-faceted ecological, cultural, economic, and political agents, providing resources such as food, water, and transportation- and liabilities including flooding and drought. Both of them are cool water sources because of the steam must be cooled after it runs through a turbine to produce electricity and for that reason it is necessary to preserve water natural sources and ocean wildlife. At the same time the coastal area provide the possibility of topographical intervention by mounds of protection and foil storage, voids of salt stepper and desalinisations and islands of renewable energies.

Conclusion

As electric lines are much like water pipes, this project explores the possibilities of power installations to improve water resources in dry areas. In the case of transmission lines, the higher the voltage, the more electricity that can be transmitted, just like a wide water pipe can carry a larger volume of water. Moreover, electrical transmission lines

operate at high voltages and carry large amounts of electricity over long distances.

Summarizing, the future power & water resources in each of these three research areas are:

CA1 Location. Mountains (CA High). It is a rural topography with density of scrubs and large forest.

- Water banks with shade balls.
- Sprinklers grid to reduce fire risk.
- Porous water reservoirs.
- Artificial aquifers.
- Salt plants.
- Purifiers through lagoons with macrophytes.
- Increasing biodiversity: birds and small mammals.
- Drip irrigations in crops.

CA2 Location. Agricultural lands (CA Mid). It is a field where the agricultural and animal production area conditions the surroundings.

- Red porous surface. Landforms (macro, normal and micro) of the use of organic subtract not only under green areas, even in sand strips that depend on the weather conditions.
- Blue intensive surface. Water storage by drainage cells which are interlocked into a flat drainage blanket in raingardens in the city.
- Green extensive surface. Vertical designs of islands, stripes and embankments of concentrated energy resources integrating infrastructural technologies such as skyscrapers.
- Yellow lighting surface. Electric strategies for new car parks where green islands have the same rights as cars reducing maintenance costs.

CA3 Location. Coastal zones (CA Low). It is an approach to the riparian and coastal vegetation dynamics.

- Mounds of protection and storage. There are three robust storage of spent fuel: low-density pools, hardened dry-storage modules and mounds of dispersed dry-storage modules.
- Voids of salt steppes. Solar salt is the least expensive technology available favoured by a dry and windy weather and it is produced by natural evaporation of seawater (3,5 % salinity)
- Voids of desalination plants. The majority of current and planned cogeneration desalination plants use either fossil fuels or nuclear power as their source of energy.
- Islands of hydrogen production. The nuclear energy produce heat for changing water into steam and the electricity for breaking the steam down into hydrogen and oxygen.
- Islands of district heating. There are residential areas, which could be benefit from nuclear reactor for heat production.
- Islands of transport research (airplanes, ships, submarines, spacecraft).
- Islands of natural reserves. They are mixed with the wastewater treatment.

Nature's endorsement of tensegrity structures is efficient because per unit mass, spider fibber is the strongest natural fibber and these structures are transferrable form nano to mega scale. This is a great challenge to develop scientific procedures to create smart tensegrity structures that can regulate the flux of water resources, as well as, thermal, mechanical and electrical energy in a material system by proper choice of material, geometry and controls. New water networks would make use of topography, soil permeability and existing infrastructure. These micro-clouds are also important to reduce fire risk, one of the consequences of droughts.

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Kopsavilkums. Kāpēc elektrolīniju infrastruktūra ir tik svarīga, salīdzinot ar ūdensapgādes tīkliem? Kā mēs varam atjaunot dabisko līdzsvaru? Šādi un citi nozīmīgi jautājumi tiek analizēti un aplūkoti caur piemēriem šajā zinātniskajā rakstā. Kopumā pētījumā analizēti vairāki elektrolīniju infstrastruktūras apgabali, ietekme uz ainavtelpu un savstarpējie aspekti starp elektroapgādes tīklu sistēmām un ūdens resursiem, kā arī novietojums, ņemot vērā gan topogrāfiskos, gan klimatiskos apstākļus.

Landscape Cognition

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Abstract. Apart from visual and sensory (audial, tactile and olifactory) aspects - it is cognitive aspects which play an important role in landscape research and planning. These cognitive aspects are characterised by knowledge acquired during the process of cognition. The knowledge then is actively used in further landscape observations and forming opinions about it. Consequently, cognitive aspects are associated with an individual's personal and professional interests formed by education, residence, mentality, gender, former experience, etc. These aspects are also associated with psychological mood during the observation process of a particular landscape. The influence of cognition processes has been previously analysed also within the framework of other sciences, basically related to the improvement of the environment of people's lives as well as social and economic background. In the field of landscape architecture the role of cognitive aspects is often associated with the understanding of the identity of the place, its aura and the feeling of belonging to a particular place, which are essential elements in the process of landscape architecture and planning. The aim of the research analysed in the article was to identify and characterise the role of cognitive aspects in different thematic fields of landscape architecture. The research was conducted within the framework of The Baltic Forestry, Veterinary and Agricultural University Network (BOVA) international doctoral study course Landscape Cognition (2015) organised by the Department of Landscape Architecture and Planning of Latvia University of Agriculture. The research analysed 8 scientific themes represented by the doctoral students and lecturers of landscape architecture of this course. The themes were divided into two thematic sections. The first section Rural Landscape Cognition included the following themes: Mainstreaming participatory development in rural Latvia and Estonia; Road landscapes, their values and development scenarios; Digital software in Landscape architecture; Seasons in landscape. The second section Urban Landscape Cognition covered the following themes: Post-industrial areas in cultural landscape of the Lielupe river; Urban forests; Public space of small towns on the Baltic Sea coast; Landscape spatial planning. Within the framework of the research through lectures and practical work the doctoral students under the guidance of the lecturers identified the keywords/criteria which most precisely characterised the role and influence of cognitive aspects in a particular doctoral student's research theme. As a result, within the framework of two thematic sections schematic models were developed where the keywords identified in the research were arranged hierarchically according to their influence and role in the cognition process of a particular field. Likewise, within each section the role of cognitive aspects was characterised in each scientific theme of landscape architecture represented by the doctoral students. The models developed within the framework of the research clearly delineate the interdisciplinary character of landscape architecture, since most of the identified criteria were referred to different scientific themes, but only a small proportion developed for a specific theme.

Keywords: landscape architecture education, Latvia, landscape Research methods.

Introduction

The peculiarities of human perception play an important role in the evaluation and planning of landscape. Perception is each person's individual impression of the surroundings [30; 29] and it is formed by visual, sensory and cognitive perception, which by interacting, interpret what we have seen and heard in our consciousness. Visual perception is one of the most important of people's senses, since visual information is the first which reaches our mind and constitutes 80 % of what is perceived [42; 35; 43]. Other senses make up sensory perception or perception of the surrounding things or phenomena through olfactory, palate and tactile senses [40; 42; 37]. Quite often the sensory perception unconsciously adds to the visual perception, for example the image of a flower together with its pleasant fragrance enhances positive emotions which we get from looking at the flower. Cognitive perception can be described as unconscious perception [39; 22] because it is connected with each individual's previous knowledge, experience and level of knowledge, and therefore, with the capability to analyse and understand the processes. An adult person knows what feelings are aroused when he/she comes into contact with something familiar and therefore this person tries to discover something new again just to have the feeling of a new discovery that the person had experienced in his/her childhood. A full interpretation of landscapes is possible only when all visual, sensory and cognitive perceptions are involved, because they supplement each other, creating a whole image of the perceived item [30; 40; 22] (Fig. 1).
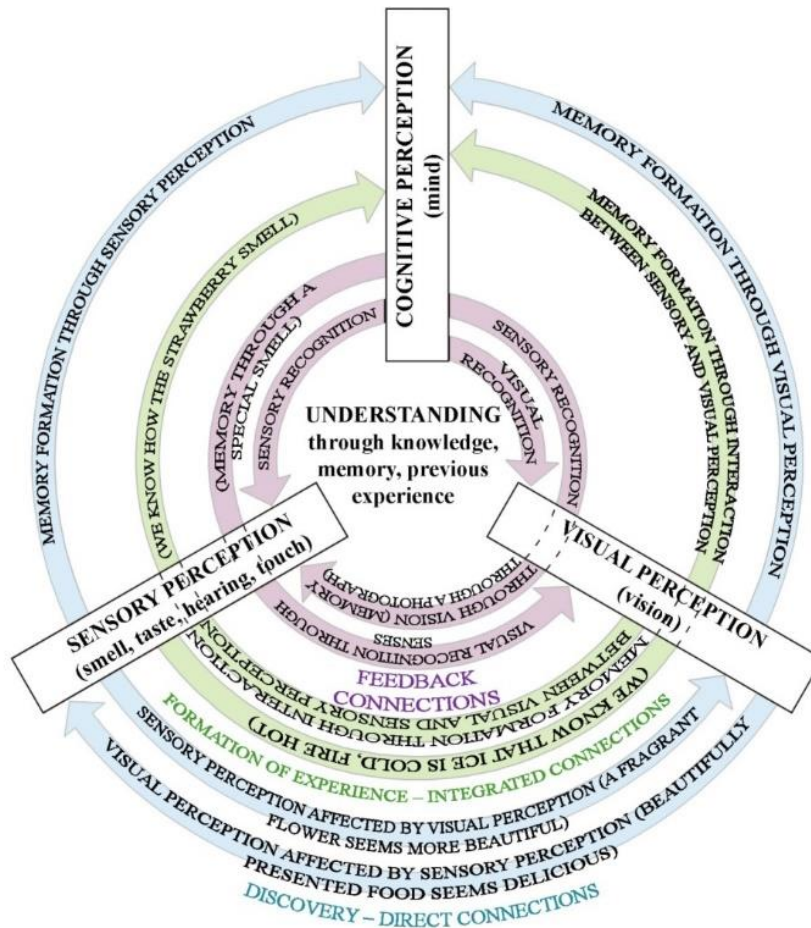
Fig. 1. Formation of Landscape COGNITION through senses [33]

Definitions of *cognitive* (from Latin *cognition* – connected with mental process of understanding) in different sources has been described as a mental action or process of acquiring knowledge and understanding through thoughts, experience, and the senses; a perception, sensation, idea, or intuition resulting from the process of cognition[36].

Thus Cognitive perception plays the leading role, particularly in the interpretation of landscape qualities, determined by human knowledge and understanding [37; 45; 18].

COGNITION is about knowledge and knowing and has been used not only in landscape architecture and planning discipline, but also in many other disciplines – tourism, marketing, communication, politics, etc. [13; 14; 15; 21], which are responsible for the life quality, social and economic benefits. Cognition involves such actions as sensation and perception, learning, memory, thinking, categorization, judgment, making decision, reasoning and problem-solving [4; 16]. Cognition also is connected with a person`s

behaviour and other characteristics (mentality, gender, age, profession, previous positive or negative experience, social status, residence, a local inhabitant or a newcomer, as well as the person's emotional mood at the moment of perception) which affects the process of obtaining information and the development of definite knowledge [30; 11; 7].

Landscape cognition is the most complex level in the understanding of landscape after seeing and perception of landscape (Fig. 2). Thus landscape cognition is an important element in the establishment of the landscape identity and aura of the place, as well as in the development of the attachment to the place [3; 7; 10; 31; 48].

The aim of this research is /identify and discuss the role of cognitive aspects in the different research themes of landscape architecture which were represented by the involved lecturers and doctoral students in The Baltic Forestry, Veterinary and Agricultural University Network doctoral study course Landscape Cognition (2015).
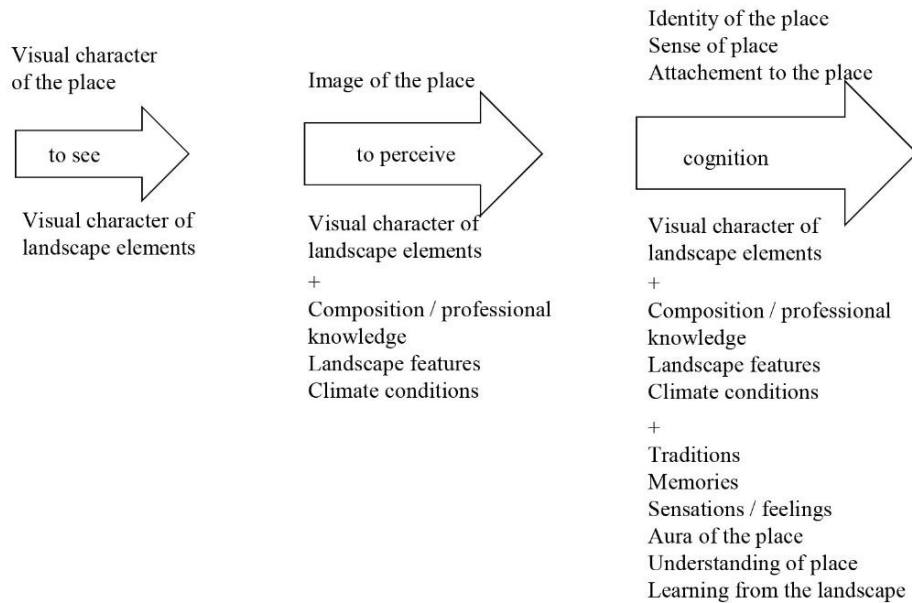
Fig. 2. Levels of landscape cognition [Source: created by D.Zigmunde]

Materials and Methods

The Baltic Forestry, Veterinary and Agricultural University Network BOVA was established in 1996 in collaboration with Latvia University of Agriculture, Estonian University of Life Sciences, Lithuanian University of Health Sciences and Aleksandras Stulginskis University. Within the framework of BOVA networking international intensive training courses are organised for bachelor, master and doctoral programme students.

BOVA course Landscape Cognition for doctoral and master level students was organised in the autumn semester of 2015. The scope of the course is 6 ECTS which includes both a distance learning section of the course with preparing of home assignment and a full time section (meeting in person) with lectures and practical work. The leading section of the course was the Department of Landscape Architecture and Planning of Latvia University of Agriculture. The participants of the course included 7 teachers from Latvia, Estonia and Norway and 8 doctoral and master students from Latvia and Estonia. The aim of the research was to determine/identify the keywords/criteria which would most precisely characterise the role of cognitive aspects in various thematic fields of landscape architecture. Therefore two work groups were formed within the thematic blocks corresponding to the course participants' scientific themes:

1. Rural Landscape Cognition with the following scientific themes:
- Mainstreaming participatory development in rural Latvia and Estonia.
- Road landscapes, their values and development scenarios.
- Digital software in Landscape architecture.
- Seasons in landscape.
2. Urban Landscape Cognition with the following scientific themes:
- Post-industrial areas in cultural landscape of the Lielupe river;
- Urban forests;
- Public space of small towns on the Baltic Sea coast;
- Landscape spatial planning.
   To achieve the aim, the following tasks were set:
- to strengthen the methodological base;
- to introduce participants of the course with landscape cognition research methods and approaches;
- to highlight the importance of cognitive aspects in landscape research;
- to discuss the role of cognitive aspects in different research fields represented by the teachers and doctoral students involved in the course; to determine/ key words to characterise cognition process in definite research theme;
- to develop shematic model of landscape cognition with the oranised key words.

The course included:
- the distance learning section, using the moodle e-studies environment (http://estudijas.llu.lv/) and the study materials it contains – the work task description, scientific articles and literature sources on Landscape cognition;
- developing Landscape cognition description within the context of each participant's scientific theme after having acquired the scientific literature included in the distance learning section;
- lectures and practical work on the concept of Landscape cognition and the methodology used in the research:

Introduction to Landscape Cognition (lecturers D. Zigmunde and N. Ņitavska from Latvia University of Agriculture). The theme deals with the definition of cognitive aspects of landscape and the characterisation of the formation of cognitive perception and its influencing factors [35; 44; 8; 45], connection with various fields of landscape architecture and modern research. Although the structure of people's eyes is similar,there are several aspects (mentality, gender, age, profession, previous experience, social status, residence – rural territory, city, as well as the emotional frame of mind at the moment of landscape perception), which influence the way this information reaches our consciousness [22; 30; 40; 11]. Unconsciously the visual information is influenced also by another kind of information which is obtained through sound, smell, touch and emotions, altogether forming a definite and individual perception about a particular landscape and its values. Having that as a theoretical base, the students carried out practical work where pictures of particular landscapes were given without additional information characterising the place. Basing on professional knowledge, previous experience and personal feelings, the students had to characterise the overall image of a definite landscape – its location (state and territory, for example, a coastal area of the sea, function, principal occupation of the inhabitants, aesthetic, ecological and social qualities. Afterwards the students received additional information about the definite place and they had an opportunity to change or improve the initially developed characterisation of the place making it more precise.

Research Methods (S.Bell from Estonian University of Life Sciences). Within the framework of the research an overview of contemporary landscape research methods has been presented using examples, particularly showing how qualitative and quantitative parameters are interrelated and how they can be interpreted. Each student presented his/her research theme which was later analysed, participating in a joint discussion.

Social Aspects in Residential Public Space (lecturer U.Īle from Latvia University of Agriculture). An important role in the process of landscape cognition is played by social aspects (inhabitants' primary and secondary needs in accordance with their understanding, experience, knowledge, social status, etc.) and their manifestation in the local scale of landscape. The landscape formed under the influence of the social aspects is the reflection of cognitive aspects affecting both - an individual and community or society in general. The influence of social aspects on landscape cognition most vividly appears in the case of courtyards of multi-storey residential buildings, which the residents use on a daily basis accepting these courtyards both as a public area available to everyone and as an individual area where one can feel safe and in harmony with the environment [19]. In the practical part of the course the students were offered a variety of courtyard situations of the courtyards of multi-storey building residential areas. In these situations, basing on the acquired theoretical basis, the role of various social aspects was determined in the development of landscape cognition.

Delphi Method (lecturer M.Veinberga from Latvia University of Agriculture). The Delphi technique is widely used when data are collected from a limited number of respondents representing specific fields of activities. This technique is organised as a group communication with an aim to reach a merging of views for a specific problem. The technique is used to reach uniformity in views, obtaining the data from a selected group of experts, using several surveys, which are adapted to a repeated questioning of the respondents [26; 17]. The experts answer surveys in two or more stages and the organiser of the Delphi survey provides a summary of the experts' answers from a previous stage [38]. Experts can revise their earlier answers compared with the replies of other experts and it is believed that during the Delphi process the number of the answers will decrease and the "correct" answers will be achieved [26; 38]. Basing on this method, the students did the practical task where each group interviewed the other group, understanding the process of the method and advantages in determining the keywords of landscape cognition.

Imageabilty Method (lecturer M.Markova from Latvia University of Agriculture). The word,

"imageability," was developed by Kevin Lynch in his book, "The Image of the City". Imageability comes from visual aspects of the landscape. While it is usually used on local scale and needs field observation, some aspects can be defined by aerial photographs. In research fields, landscape indicators have only been used recently. It is important to understand that an indicator alone provides only little information, and it is valuable when an indicator is used together with a wider system, as each indicator needs to have – representativeness, accessibility, reliability and effectiveness [27; 28]. To understand the principles of the operation of this method, the students did the practical task in the vicinity of the nearest landscape, analysing the views according to Kevin Lynch'es method.

Examples of Interdisciplinary Reaserch (lecturers D. Zigmunde and N. Ņitavska from Latvia University of Agriculture). At the end of theoretical lectures and practical work a summary was conducted on different themes of interdisciplinary landscape research where cognitive aspects are also included. Here the links are important between the physical and mental, social and spiritual, between the natural phenomena and the traditions as well as other links forming the versatile essence of landscape research and can be based on the multidisciplinary research approach.

Academic Writing (lecturer K. Jorgensen from Norwegian University of Life Sciences), where students acquired the methodological base for the publication of the results of scientific research in scientific journals.

workshops in two thematic work groups under the teachers' guidance for determining keywords and their hierarchial arrangement in the schematic landscape cognition model;

Improvement and clarification of Landscape cognition characterisation in the context of each participant's scientific theme upon the completion of the course.

Results and Discussion

Within the framework of the research the main landscape cognition keywords were identified in the context of 8 landscape architecture scientific themes, joining them into two thematic landscape cognition schematic models:

1. The scientific themes dealt with in section Urban landsscape cognition:

    1.1. Post-industrial areas - the cognitive evaulation of abandoned industrial landscape.

By analysing the sources of scientific literature it was determined that the growth of industrial society is one of the most distinctive ocurrences in modern history. Due to industrialisation society was able to change the continental scale of landscapes and influence the climate of planet Earth. Capitalist industrialisation initiated economic and social changes and it is still defining social and geopolitical changes [9]. In his work "Industrial Ruins: Spaces, Aesthetics and Materiality" Tim Edersor considers that abandoned industrial landscapes are mostly visually unattractive, but on the other hand – for separate groups such as homless people, searchers of non-ferrous metals, teenagers (who use the territory for graffiti tagging or role plays and "headquarters") this abandoned area turns into a place where people can manifest themselves. As well as according to the theory of environment aesthetics, the objects (landscapes or things) can be perceived in two different ways – by senses (non-cognitively) or using previous knowledge (cognitively) [12]. David Nye in his work "American Technological Sublime" (1994) described the American experience in the research of degraded territories. One of the most significant conclusions was the idea about the formation of the collective experience. A definite group of people who share common memories and experience concerning a definite question, for example - factory workers will form the collective memory, since they belong to one social group. It is quite probable that an abandoned industrial area will seem attractive or even noble to them due to the fact that they used to belong to that place in the past [34]. The Soviet period in Latvia has left a deep imprint in people's memories, therefore, in most present day cities everything that was built during the Soviet time is preceived as the stigma of that period.

1.2. un 1.3. Public space in small towns and urban landscape spatial planning. In scientific literature it has been emphasized that only the urban environment has a peculiar phenomenon. At the moment when we lock the door of our home or close the gate of our garden we find ourselves in the city's public outdoor space. This outdoor space is freely accessible to everyone. It is a place where people can be freely engaged in different kinds of activities which are mostly connected with life and life environment qualities – such as health, social interaction and economic value [32]. At the same time it is a space we share with all the inhabitants and visitors in the city. Thus the development of this space becomes complicated, since it is common to all of us but very often each of us wants to see it

different, better, cleaner or safer. Public outdoor space in a city starts from the pavement of the house we live in, driveway, the street leading to the squares and city parks, thereby the image of public outdoor spaces directly depends on the people's actions and landscape cognition, determined by different historical events, cultural, economic and nature processes. The way each of us shows the attitude to the public outdoor space directly depends on the person's cognitive aspects – cognition and reasoning abilities, perception and the acquired knowledge [24]. When people come to a place, they take with them the previous experience, something that had been acquired from the family or society – the collective memory, ethnic or religious prejudices and lastly - mutual feelings which stem from the interaction between the environment and people.

The place itself also carries with it history or memory. This memory is formed by its inhabitants both – by each individual and the society in general (collective memory). Collective memory is formed from what has been experienced in the place and from what has happened there, which mainly evokes feelings associated with these memories and makes an emotional connection with the place. Likewise, each of us and society in general, leave behind the witnesses of the time or direct reminders, such as architecture, monuments, names of the streets, the style of city planning, etc. Each of these direct reminders arouse interest in the next generations to discover the long gone past, which helps recognize the transformation processes of that place and discover the identity of today's place [23].

1.4. Urban forests. In the scientific literature urban foests in the context of people's perception have mainly been analysed within the context of the aesthetic and ecological interaction. Urban forests have been more intensively used for the recreation purposes and less for commercial purposes. Due to this reason people's attitude and perception are very important for the development of these territories. The major criterion in urban forests landscape cognition is considered to be an individual's knowledge about the ecological quality of the forests (biological diversity, nature protection, etc.) which also influences understanding about the aesthetic quality of such territories [35; 5].

As a result of the activities of the group of thematic section Urban Landscape cognition, a schematic urban landscape cognition model was developed. It is based on the following conclusions:

▪ the set of Landscape cognitive criteria depends on each individual's personal and perception qualities as well as knowledge acquired during the life time

obtained in the cognitive processs of studying the surrounding environment in childhood and through professional experience in adulthood (Fig. 3);

▪ each individual's cognitive perception of landscape changes with the acquisition of new knowledge and the formation of experience in the course of time (Fig. 4);

▪ the landscape cognitive criteria is based on the balance between knowledge and experience, where memories, feelings, mentality, ideology, personality, ocurrences, social and cultural events play an important role;

▪ the criteria characterising specifically urban landscape cognition include mainly the aspects and keywords connected with people's activities (Fig. 5). They are grouped into categories related to pecularities of an individual's and society's perception and also to economic and cultural processes (Fig. 6).

1. In the thematic section Rural landscape cognition the following scientific themes have been addressed:

2.1. Mainstreaming Participatory development in rural landscape. The research indicated that Landscape Cognition is a term used to describe how the observers perceive landscapes. When observers view a landscape, they are not just seeing the elements that are within that landscape, but they are viewing it through the lens of their past experiences, their cultural background, their knowledge, their unique character. Even their perspective comes from the aspects particular to the moment, such as the season, the weather and the observers' mood. It is a shifting, changing perspective and yet vitally important for understanding how inhabitants and visitors view rural landscape. In mid-summer the swaying grasslands, rich in meadow flowers for many in Latvia are reminiscent of the time of Ligo and Jani, the important cultural markers of the year and a celebration of the summer solstice. Many people also remember the times spent on their grandparent's farms relishing the freedom of summer, whilst their parents continued to work in the cities. The "vienseta"- "the idyllic scene of an old farmstead with a pond, an orchard and storks nesting nearby is intricately entwined with the Latvian sense of identity, albeit a fast disappearing one" [41. It is a cultural symbol that marked times of independence as a nation state in its own right and a view of how a farmstead should be. Many Latvians, therefore, view scrubland, a rich ecosystem to an ecologist, as a mess and not as element of a well-cultivated landscape that they long for. Character also plays a part in the cognition process. A person with a timid character may view
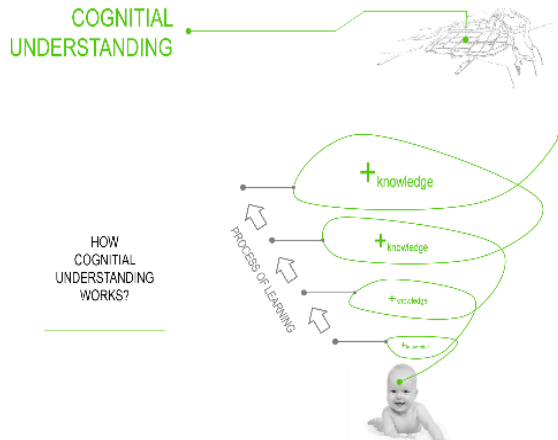
Fig. 3. Development of Landscape cognition through learning
[Source: created by authors Anna Katlapa, Anna Kalniņa, Tamāra Patrina, Laura Šterna]
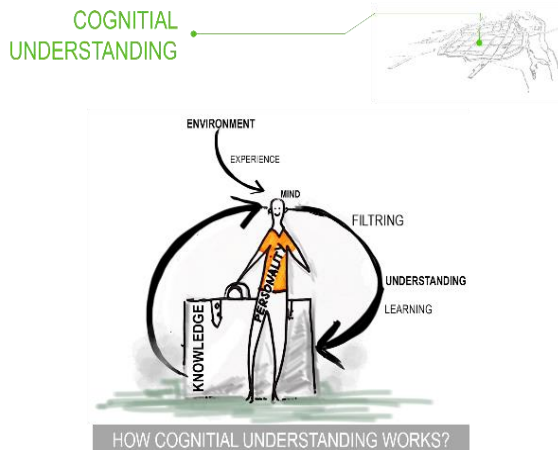
Fig. 4. Impact of surounding environment, knowledge in the process of understanding of landscape
[Source: created by authors Anna Katlapa, Anna Kalniņa, Tamāra Patrina, Laura Šterna]
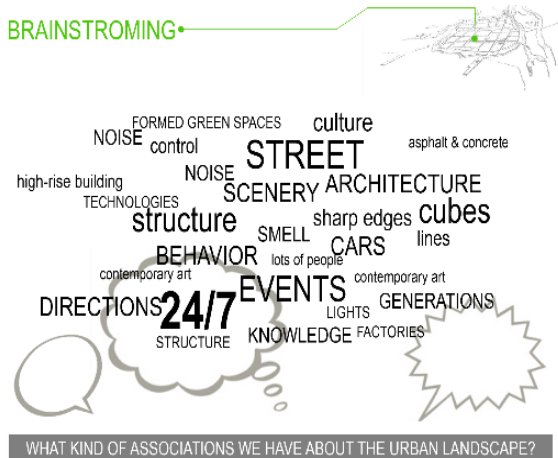
Fig. 5. Keywords of Urban landscape cognition
[Source: created by authors Anna Katlapa, Anna Kalniņa, Tamāra Patrina, Laura Šterna]

a mountain scene as an awe inspiring sight, but the view from the mountain top as something to be feared. A mountain climber or someone with an adventurous spirit, however, may see the same view as a challenge and the mountaintop as an accomplishment. Likewise a typical rural view may be viewed as a peaceful place away from the buzz of the city by those who enjoy the peace and quiet of the countryside or the familiarity of home by those who live there, or it may be viewed as boring and lacking life by the those who enjoy the city rush or by the younger generation of the rural population who are eager to leave home.

2.2. Road landscape. In scientific literature it has been pointed out that roads play an important role in our days. With the increase of people's mobility the connection with road Landscape has become a part of everyday life. Many of the landscapes are seen from the road and views from the road generate the impression about the country [6; 1]. Some roads have gained special scenic road status due to their character (America's Byways). Perception of the road landscape depends on vision, physical barriers along the road, travelling speed. Interpretation of the perceived landscape is connected with cognitive aspects. For the road landscape design it is important to understand what is perceived by people as scenic. The methods used for road landscape evaluation are often based on the professional judgment of experts. Some researchers like L. Kent have used the cognitive approach working with the complex human/landscape interaction and scenic qualities of the road landscape [20].

*2.3. Seasons in landscape. From very early days s*easonality has influenced the formation of people's understanding.. It was through nature that primaeval man got acquainted with nature's determined influence of ecological processes in everyday's life and received the first positive feelings and aesthetic experience aroused by watching the various forms of nature's elements [22]. The cognition of aesthetics facilitated the introduction of compositional techniques, which, starting with building traditions of ancient cultures, are widely used till nowadays in different fields of art, architecture, design and other fields [42; 35;22].

2.4. Landscape cognition through digital design. For a hundred years, pencils, pens, markers, and watercolours have been the principal tools of representation for landscape architects and urban planners. Today those hand-powered aids have been replaced by computers and Computer-aided design (CAD). Digital Drawing for Landscape Architects
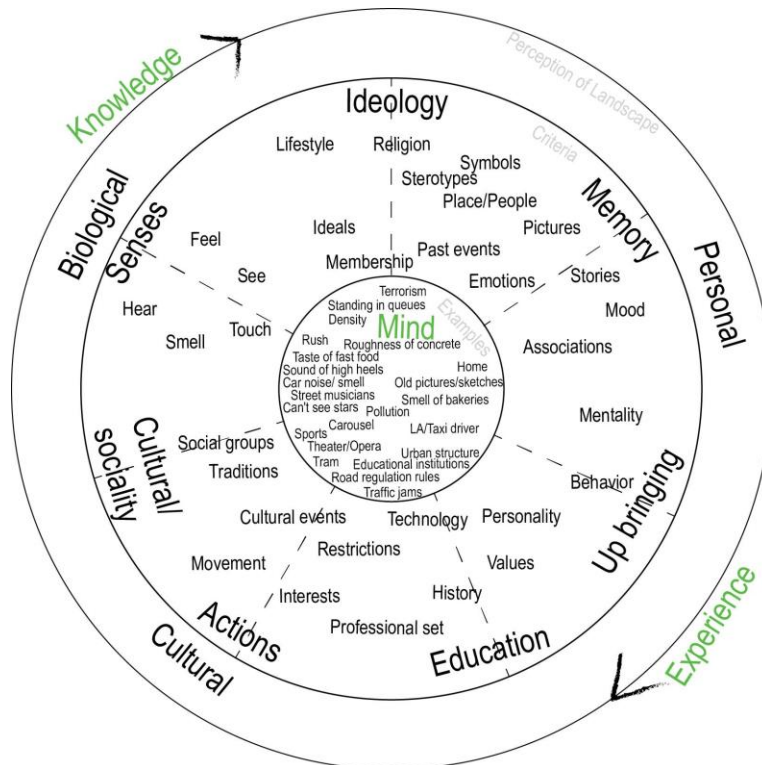
Fig. 6. Urban landscape cognition *categories*
[Source: created by authors Anna Katlapa, Anna Kalniņa, Tamāra Patrina, Laura Šterna]

bridges the gap between the traditional analog and the new digital tools and shows you how to apply timeless concepts of representation to enhance your design work in digital media [47]. Traditional two-dimensional communication methods using renderings, design plans, and maps have not been fully successful in their ability to engage and sufficiently inform clients and stakeholders. While professional planners are able to rely on their experience to help them visualize the proposed landscapes, the average client is often overwhelmed by the relatively complex and abstract information, and unable to translate this information into landscape visions. Developments in the field of 3D graphic design have dramatically extended the possibilities to overcome this barrier by providing a tool that produces designs that are easy to comprehend and helps clients better visualize the end product that the designer has put forth [25; 47]. Building a 3d virtual and interactive model is extremely bifacial in many aspects of the Landscape Architecture process. The digital world helps the landscape architect to communicate with society through Visual communication. Visual communication touches many subjects such as perception, communication, language, marketing, image making, image analysis, rhetoric, etc. How we

perceive an image and what influences us is affected by many different things. Within the cognition context perception is a mental interpretation of feelings or sensations produced by stimuli from the surrounding world. It is a fundamental function to keep individuals informed about the world. Perceptions occur with an inner picture that is organised so that we can generate appropriate actions. The visual perception is a personal judgment that can transpire quickly and spontaneously. On one level, it is a superficial and preconceived judgement that usually leads to two actions within the viewer – rejection or response. This quick judgment is not always fair. It is impossible to predict the reactions. The beholders' different criteria of how they perceive the picture can be vast. It is about personal impressions, consistency, values, knowledge and the experience the beholder has [46]. Digital designs, especially 3D simulations, cover excellent ways of human perception through the senses, understanding of the place and Landscape architects' vision of the space.

As a result of the work carried out by the working group of the thematic section Rural landscape cognition a schematic model of rural landscape cognition was developed (Fig. 7), based on the following concepts:
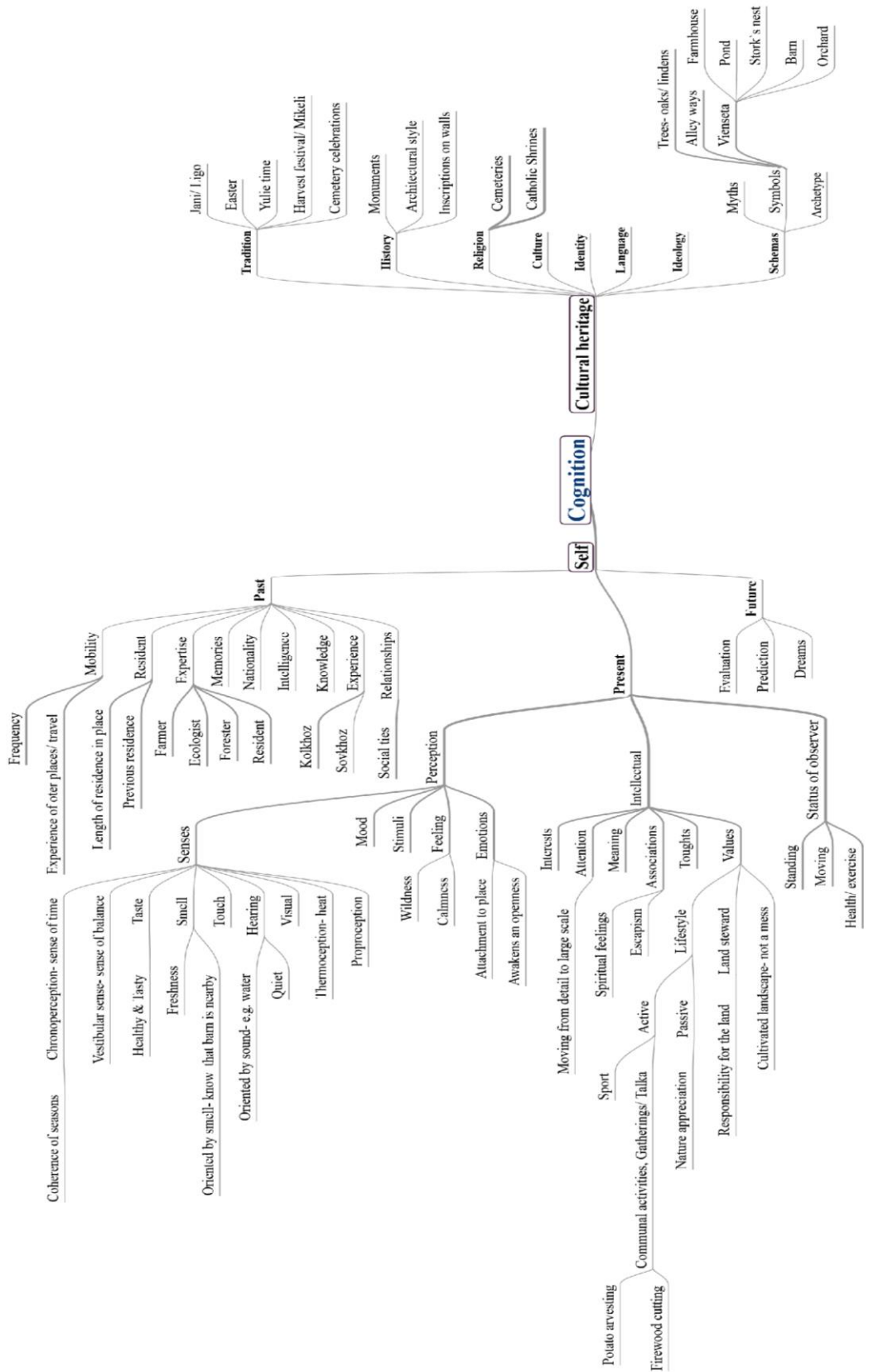
Fig. 7. Schematic model of rural landscape cognition
[Source: created by authors Kristīne Vugule, Joanna Storie, Indra Purs, Arturs Mengots]

- the whole set of cognitive criteria is divided into two groups: cultural historical and personality criteria;
- the cultural historical cognitive criteria set includes – identity, language, traditions, history of place, ideology, the symbolic and mystical meaning of landscape elements;
- the personality cognitive criteria set includes three big sections – past, present and future where the keywords are connected with the experience, emotions, dreams, knowledge, social status and activities.

In the works of both thematic sections working groups the tendency to closely relate landscape cognitive aspects with an individual's personal experience, mentality, knowledge and emotional state has been observed. It confirms the close ties of landscape with people and a consistent interaction not only at the physical but also at the mental and spiritual levels. In landscape research the role of cognitive aspects increases with the involvement and interference of people in the natural processes of landscape. At the same time the influence of rural landscape on people's cognitive perception level is no less important and it forms the individual's personality on the whole. Both working groups have acknowledged the close mutual influence of landscape and people on the formation of the individual's and society's cognitive perception.

Conclusions

The human's perception is determined by visual, sensory and cognitive perception, which through the process of interaction interprets the observed and is sensed in our consciousness. Thus, alongside with the development and transformations of landscape which take place under the influence of nature, socioeconomic and political factors, cognitive experience is formed in humans. This experience determines the way and form in how humans change the landscape around them.

Cognitive perception is of particular importance. It plays an important role in the interpretation of the landscape qualities, because it is determined by human's knowledge and understanding of landscape values, for example, ecology and an environmentally friendly lifestyle.

In the research of both urban and rural landscape cognition it was established that in both thematic sections the common criteria are those which characterise personal and professional qualities of an individual which are involved in the formation of cognitive perception. The criteria related to the specific features of urban or rural landscape – such as the use of the territory, traditions, characteristic visual elements of landscape (streets, buildings, nature elements, etc) are different.

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Kopsavilkums. Bez vizuālajiem un sensorajiem (dzirdes, tautes, smaržas) aspektiem ainavu izpētē un plānošanā būtiska loma ir tieši kognitīvajiem aspektiem. Tos raksturo izziņas procesā iegūtās zināšanas, kas aktīvi tiek izmantotas turpmākos ainavu vērojumos un spriedumos. Līdz ar to kognitīvie aspekti saistīti gan ar personīgajām, gan profesionālajām indivīda īpašībām, kuras veido izglītība, dzīves vieta, mentalitāte, dzimums, vecums, iepriekšējā pieredze u.c., kā arī psiholoģisko noskaņojumu konkrētās ainavas vērošanas laikā. Kognitīvās izziņas procesu ietekme iepriekš analizēta arī citu zinātņu virzienu ietvaros, kas galvenokārt saistīti ar cilvēka dzīves vides, sociālā un ekonomiskā fona uzlabošanu. Ainavu arhitektūras jomā kognitīvo aspektu loma bieži vien tiek saistīta ar vietas identitātes izpratni, vietas auru un piederības sajūtu konkrētai vietai, kas ir būtiski elementi ainavu arhitektūras un plānošanas procesā.

Rakstā analizētā pētījuma mērķis ir noteikt un raksturot kognitīvo aspektu lomu ainavu arhitektūras dažādās tematiskajās jomās. Pētījums veikts Baltijas mežsaimniecības, veterinārijas un lauksaimniecības universitāšu tīklojuma (BOVA) starptautisko doktorantūras kursu „Landscape Cognition" (2015) ietvaros, kurus organizēja Latvijas Lauksaimniecības universitātes Ainavu arhitektūras un plānošanas katedra. Pētījumā analizētas šajā kursā pārstāvēto ainavu arhitektūras doktorantu un lektoru 8 zinātniskās tēmas, kas sadalītas divos tematiskajos blokos. Pirmajā blokā "Lauku ainavas kognitīvie aspekti" ietvertas sekojošas tēmas: sabiedrības līdzdalība lauku ainavas attīstībā Latvijā un Igaunijā; Ceļu ainava, tās vērtības un attīstības scenāriji; Informācijas tehnoloģijas (IT) ainavu arhitektūrā; ainavu sezonalitāte. Otrajā blokā "Urbānās ainavas kognitīvie aspekti" aptvertas tādas tēmas kā Post-industriālās teritorijas Lielupes kultūrainavā; Pilsētas meži; Piekrastes mazpilsētu publiskā ārtelpa; Pilsētvides telpiskā plānošana.

Pētījuma ietvaros studiju kursa doktoranti lektoru virsvadībā caur lekcijām un praktiskajiem darbiem noteica galvenos atslēgvārdus / kritērijus, kas visprecīzāk raksturoja kognitīvo aspektu lomu un ietekmi konkrētajā doktoranta zinātniskajā tēmā. Rezultātā divu tematisko bloku ietvaros izstrādāti shematiski modeļi, kuros hierarhiski sakārtoti pētījuma ietvaros noteiktie atslēgvārdi / kritēriji pēc to ietekmes un lomas konkrētās jomas kognitīvās izziņas procesā. Tāpat arī katrā blokā īsi raksturota kognitīvo aspektu loma katrā no doktorantu pārstāvētajām ainavu arhitektūras zinātniskajām tēmām. Pētījuma ietvaros izstrādātie modeļi skaidri iezīmē ainavu arhitektūras starpdisciplināro raksturu, jo lielākā daļa noteikto kritēriju tika attiecināti uz dažādām zinātniskajām tēmām.

Aesthetics and Ecology in Planning of Urban Green Spaces of Latvia

Maija Veinberga, Daiga Zigmunde, *Latvia University of Agriculture*

Abstract. Aesthetics and ecology in urban planning are opposed, especially in the case of landscape transformation without understanding the natural processes; it results in a conflict between aesthetic and ecological qualities because of specific features of human perception. The increase of anthropogenic load in large cities, interest in the use of ecological principles in planning of urban green spaces and factors of human perception of landscape preference were the reasons for choosing the topic of this research. The aim of the study was to carry out the assessment of ecological and aesthetical quality of urban green spaces. The research was divided in landscape inventory and quality assessment in selected urban green spaces. In this research landscape structure of Liepaja, Jelgava, Rezekne and Valmiera cities was analysed and 36 green spaces were selected for the research. This study includes the results of landscape inventory of the existing situation of green spaces and the analysis of the data obtained in the landscape inventory of green spaces of four research cities. The results indicate that urban green spaces are strongly influenced by compositional unity, uniqueness, coherence with architecture, naturalness, typicality and use of native plants. Also the study did not reveal the individual regional characteristics accented in the plantings and design of urban green spaces. Green spaces selected for the study were divided in four groups according to the assessment of landscape aesthetic and ecological quality. Based on the research results, three different development models of urban green spaces were designed, which can be used for the development prospects in decision making. The main conclusion of the study is that in the future there should be detailed analysis of existing values and regional characteristics of urban green spaces by local municipalities. Planning documents of urban areas and green spaces should include the guidelines of increasing both aesthetic and ecological qualities and regional differences.
Keywords: urban green spaces, landscape assessment, urban landscape, landscape ecological and aesthetic quality, landscape structure of the cities.

Introduction

The study of aesthetic and ecological quality of urban green spaces carried out in this research points out the contributing factors of the problems in this area and potential ways to solve them. The study of aesthetic and ecological quality of urban green spaces carried out in the Thesis points out the contributing factors of the problems in this area and potential ways to solve them. The problems of urban landscape include the increase of hardscapes with low permeability, which reduces the proportion of natural areas and disturbs rainwater management in the city [17, 15]. Shaping of homogeneous planting reduces biodiversity, which conversely stimulates the extinction of certain plant and animal species [12, 6]. The lack of green spaces in urban settings increases air and water pollution, which results in a decline of climate regulation. The lack of natural sites gives a negative impact on human's mental and physical health [22, 9, 3, 4, 7]. Fragmentation of natural areas in urban environments decreases the proportion of ecologically valuable habitats and causes their isolation [5, 10, 16]. Specific features of human perception cause a conflict between nature and the human desire to influence it, such as improvement of natural areas to match up to the established aesthetic model [13, 14, 19, 21]. Pleasant and attractive landscape in urban environments is most often associated with human transformed rather than natural landscape.

Latvian cities have an opportunity to develop urban green space systems, using different financing funds from European and other regional countries, but the development of these areas have to be designed in accordance with various international laws and regulations, for example, *Convention Concerning the Protection of the World Cultural and Natural Heritage* (1972), *Convention on Biological Diversity* (1992) and *European Landscape Convention* (2000), thus the planned areas should be diverse, sustainable and well-managed, providing a qualitative life environment for both human and other living organisms. The research examines development possibilities of urban green spaces through the identification of the current situation, which can determine the necessity of maintenance and display of existing values, development direction of area as natural or artificial, and also improvement options for green space in order to provide multi-functionality of the particular city and neighbourhood.

The subject of research is aesthetic and ecological quality of urban green spaces, their use in sustainable urban public open space planning. The object of research for landscape aesthetic and ecological quality assessment is public green spaces of Latvia's large cities (Fig. 1) Liepaja, Jelgava, Rezekne and Valmiera – parks, squares, plazas, waterfront areas and street plantings.
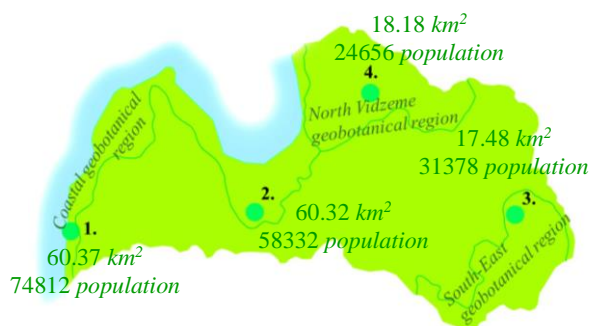
1. Liepaja, 2. Jelgava, 3. Rezekne, 4. Valmiera.

Fig. 1. Location of selected cities in a map of Latvia [Source: created by M.Veinberga, 2016]

The aim of the study was to assess ecological and aesthetic quality of urban green spaces basing on the principles of sustainable landscape development and taking into consideration regional characteristics of the territories and specifics of the urban ecological environment. The main tasks stated were the following:

- to carry out a survey of urban green spaces in four cities: Liepaja, Jelgava, Rezekne and Valmiera;
- to analyze landscape ecological and aesthetic quality of 36 urban green spaces in four different cities;
- to classify development models of green spaces for optimal use of landscape aesthetic and ecological qualities.

Materials and Methods

For the study four of Latvia's large cities were selected from different geographical and geobotanical areas with regional characteristics. The selected cities are comparable in terms of population and area: Jelgava with Liepaja and Rezekne with Valmiera. In the research study, 36 different urban green spaces were selected (parks, squares, plazas and waterfront areas). Parks were defined as green spaces that occupies an area from 2,1 to 50 ha, but squares includes an area from 0,1–2,0 ha, plaza is an urban green space, which is mainly used for public events and dominated by lawn or hardcover. Waterfront areas are located on banks of waterfronts or waterbodies mainly consisting of plantings and natural vegetation. Most of the parks of cities selected for study include natural topography or historical object that acts as the node of green network. Plazas are located in the main intersections of roads and they are dominated by ornamental hard cover for public events, recreational and landscape features. Squares are located by the secondary roads, usually densely closed with trees and other groups of plants for passive recreation. Waterfront areas are located on the banks of lakes and rivers, they are

mainly covered with plants and natural vegetation that provides access to water, protection from environmental pollution and landscape and biological diversity of urban area.

In the selected cities a landscape inventory and assessment of ecological and aesthetic quality of urban green spaces were carried out. Landscape description was carried out in the framework of landscape inventory using value allocation of certain landscape features dependent on specific criteria [1, 32, 33; 2, 10, 11]. Overall, the study surveyed 16 parks, 10 squares, 6 plazas and 4 waterfront areas in four Latvian large cities. Landscape assessment matrix contains the description of what the green space should look like to get the different score for all of the criteria in five grade system (Table 1). Each criterion is expressed in distribution of five points, where additional value is given for specific rated factors. After the landscape inventory the obtained data were quantified using a landscape assessment matrix, in order to compare the data of different green spaces in different cities.

During the landscape inventory of green spaces in four selected cities – Liepaja, Jelgava, Rezekne, Valmiera – landscape description, collection of information and registration was carried out. During the development of research a number of photofixations in Liepaja, Jelgava, Rezekne and Valmiera was made in different periods of time: from July 2012 to September 2012, from August 2013 to October 2013 and from July 2014 to September 2014. Images of different parks, squares, street greenery and functional areas of cities were obtained at photofixation. Studies of current situation were repeated in green spaces, which were reconstructed or improved after summer of 2012 (all in all in 7 green territories). Landscape inventory matrix consisted of nine parts: general details about the green space and inventory, the description of landscape type, detected plant species, the assessment of constructed elements, the description of architecture, detected wild animals, management of landscape, elements of architectural landscape space and the function of the green space (Fig. 2).

Landscape inventory and assessment were based on 12 criteria selected from scientific literature. In order to avoid of the lack of research objectivity, the studies of landscape architecture should involve specialists from different disciplines (architects, landscape architects, ecologists, historians, geographers, regional planners). The selected criteria characterize aesthetics and ecology of green spaces, based on landscape surveys. The assessment methodology of the aesthetic and ecological quality of landscape is applicable in other landscape research, for example, for the assessment of courtyards of multi-storey residential buildings and plantings near public buildings.

TABLE 1

Transcript of assessment criteria of green spaces
[Source: construction by M.Veinberga]

Name of criterion	Grade	Recognized factor, that gives points
Compositional unity	1–2	Suitability of functional use
	1–2	Harmony of composition of design
	1	Visits to the area and engagement of people
Uniqueness	1–2	Difference from other areas
	1–2	Unique historical or natural elements
	1	Site has its story of traditions
Coherence with architecture	1–3	Coherence of height of buildings and plants
	1–2	Coherence of style of buildings and composition of the area
Maintenance and upkeep	1–5	The amount of signs of landscape care
Decorativeness of plants	1–3	Colourfulness of plants
	1	Bright and flowering plants
	1	Rare (exotic) plants
Condition of constructed elements	1–5	Proportion of qualitative elements versus worn and broken elements
Naturalness	1–2	Elements of natural shape
	1	Design composition is coherent with natural base
	1–2	Amount of plantings
Native plants	1–5	Proportion of native plant species
Typicality	1–2	Coherence with natural topography
	1–2	Plants characteristic to the region
	1	Specific landscape type
Vegetation structure	1–2	No vegetation or only trees
	1–2	2–3 types of plants found
	1	All types of plants found
Wild animals	1–5	The number of classes of animals (insects, birds, amphibians and reptiles, fish, mammals)
Wilderness	1–2	Wear and tear and lack of constructed elements
	1–2	Level of overgrown
	1	Presence of weeds

Results and Discussion

Landscape elements in city public spaces

The most part (78 %) of surveyed green spaces are flat. The surveyed areas according to their composition can be divided in four groups: figurative, linear, circular and without constructed elements. The most common type of layout is linear (found in 13 green spaces), while in the city of Jelgava the most common is figurative line created layout – 6 green spaces (total in 12 green spaces in all cities). The circular layout is typical to recently reconstructed squares and plazas, where it is marked by a central element. Composition and spatial planning of green space influence views, shading, sense of space and attractiveness of place. 20 of all surveyed green spaces are characterized by an open space, they are waterfront areas, plazas and squares with limited proportion of vegetation and reconstructed parks with new trees.

Particularity of green space is influenced by its difference from a traditional city park. It can be composition of original design, shade, various historical objects, old trees, peculiar natural conditions or the use of this area in the past that attach uniqueness and identity. Historicity and particularity is related with harmony of architecture and landscape. Some green spaces are historically established next to significant architectural objects, while other areas are not designed according to the buildings in the area of green space. Several surveyed green spaces are limited by lines of buildings, therefore the height and shape of vegetation used in the area must be appropriate to the height of buildings. Rows of trees in built-up areas soften the building silhouettes. In the areas, which are limited by multi-storey buildings, accent to tall trees with large crowns are set up. These areas are located in districts of multi-storey buildings and city centre, which is characterized by public buildings. The height of trees in green spaces, which are limited with rows of private houses, is lower – appropriate to the height of buildings.

The city vegetation is dominated with alien plant species (92 % from all green spaces), because green spaces provide favourable conditions for growth and reproduction, however use of native plant species in public spaces is an important contribution to the conservation of species, society education and maintenance of regional specifics. 106 different species of trees, 80 bushes, 15 annuals and 55 perennials in surveyed 36 green spaces have been identified. Only 61 from all detected plant species
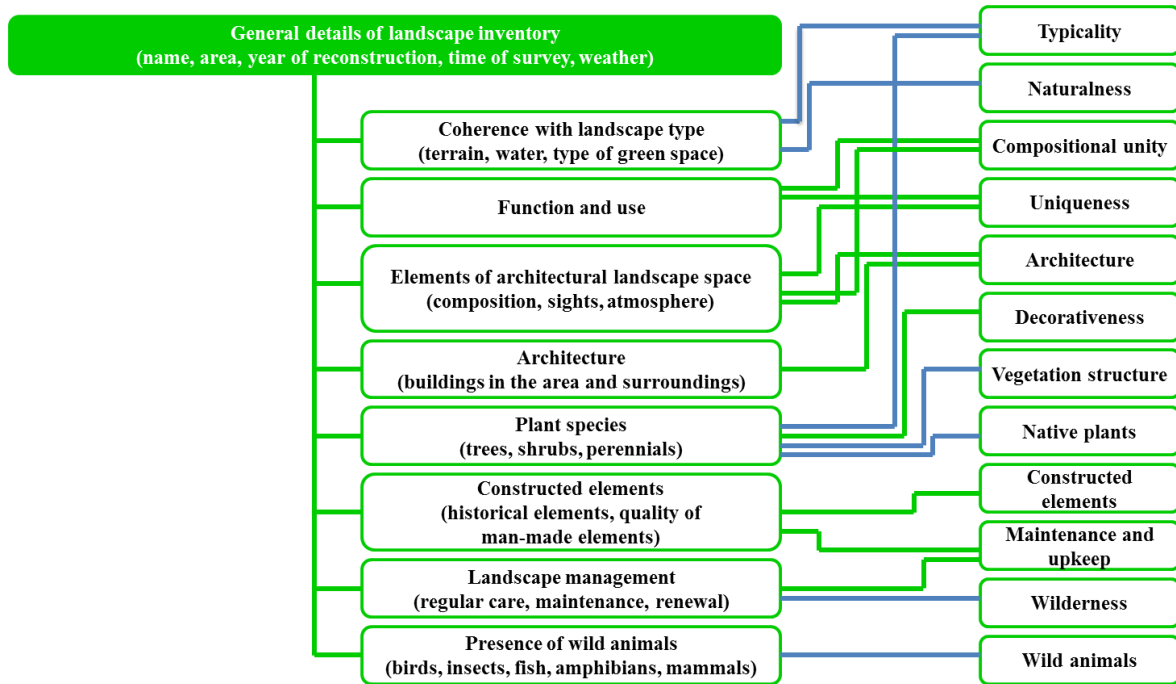
Fig. 2. Data obtained in inventory and their relation to assessment criteria
[Source: created by M. Veinberga]

were native. The dominant native species found in surveyed areas were Tilia cordata, Acer platanoides, Quercus robur, Betula pendula, Fraxinus excelsior, Corylus avellana and Potentilla fruticosa. Landscape inventory identified 41 very rare and unique foreign species of trees and bushes. Most of these species were located in old parks next to historical buildings. The research discovered regional characteristics of urban green spaces. Green spaces of Valmiera and Liepaja are dominated by pines (Pinus). Liepaja and Jelgava belong to one geobotanical region [25], but after the results of landscape inventory, plant structure of green spaces of Jelgava is similar to vegetation of Zemgale geobotanical region [20]. The most frequent composition of woody species of South-East and North Vidzeme geobotanical regions are similar [26, 27], still South-East region is slightly bare in terms of rough climate conditions.

The quality of constructed elements influences aesthetics and a visual impression of green space. As the result of a landscape inventory surveyed green spaces can be divided in four groups according to their quality of man-made elements. The first group includes new or reconstructed green spaces and old parks where landscape elements are maintained and restored: 76–100 % of identified constructed elements are of good quality. The second group consists of green spaces whose compositional design does not satisfy modern needs, but these areas are constantly improved, thus satisfying the aesthetic desire of city residents (50–75 % constructed elements are of good quality). The third group includes green spaces which have

retained composition created in Soviet period and they need improvements and qualitative landscape elements (10–50 % constructed elements are of good quality). The last group are set up from green spaces without constructed elements and are left for the impact of natural processes. The condition of constructed elements is related to management and tidiness of green spaces. In areas which are regularly tended high quality elements remain, while in the unmanaged areas which are left for nature, constructed elements are outworn or even have disappeared. The research results of green space maintenance and care revealed that most of the green spaces are regularly maintained and tended. Almost all parks and squares which represent first three groups and are divided according to quality of constructed elements have mown lawns (30 green spaces), mulched plants (17 green spaces), shorn shrubs, new trees planted and flower beds created.

Topography and location of landscape elements of the city influence the landscape spatial structure. In the main centre of all selected cities one or few urban green spaces are located. Urban green space is determined by water bodies, watercourses and transport lines (roads, railways), which limit urban sprawl and configuration of green spaces. The structure of city is influenced by natural relief, especially in Rezekne and Valmiera, where the height difference between valleys of the river and the lake and other built-up parts of the city are very perceptible. Rezekne and Valmiera are very compact cities that are densely developed close to water and

● – Liepaja; ● – Jelgava; ● – Rezekne; ● – Valmiera
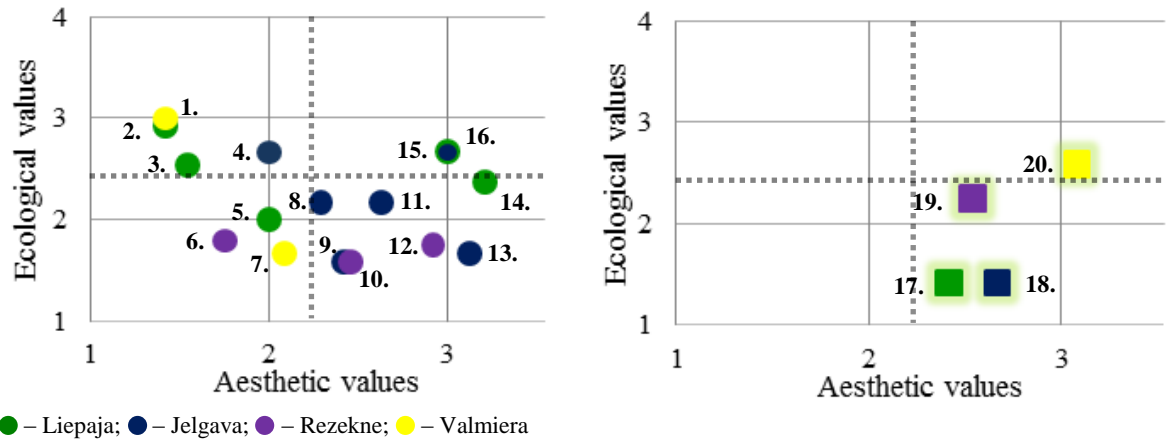
1. Jāņparks; 2. Dunikas ielas parks; 3. Karostas parks; 4. Valdekas ielas parks; 5. Ventspils ielas parks; 6. Ziemeļu rajona parks; 7. Vecpuišu parks; 8. Ā. Alunāna parks; 9. Uzvaras parks; 10. Kultūras un atpūtas parks; 11. Stacijas parks; 12. Festivāla parks; 13. Raiņa parks; 14. Jūrmalas parks; 15. Pils parks; 16. Raiņa parks; 17. Ostas promenāde; 18. Driksas promenāde; 19. Rēzeknes upes promenāde; 20. Dzirnavu ezeriņš

Fig. 3. Average rating of parks and waterfront [Source: created by M. Veinberga]

● – Liepaja; ● – Jelgava; ● – Rezekne; ● – Valmiera
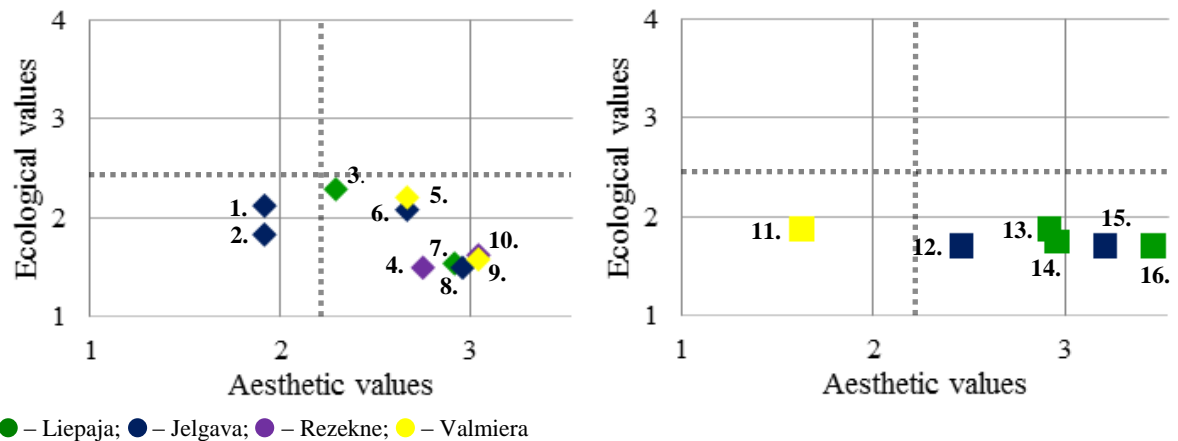
1. Zvaigžņu ielas skvērs; 2. Kultūras nama skvērs; 3. Pļavu ielas skvērs; 4. Pareizticīgo baznīcas skvērs; 5. Lucas skvērs; 6. Ozolskvērs; 7. Kurzemes skvērs; 8. Vaļņu ielas skvērs; 9. Centra skvērs; 10. „Zeimuļs”; 11. Vienības laukums; 12. Hercoga Jēkaba laukums; 13. Gulbīšu dīķis; 14. Čakstes laukums; 15. Trīsvienības baznīcas laukums; 16. Rožu laukums

Fig. 4. Average rating of squares and plazas [Source: created by M. Veinberga]

transport nodes. The building boundary of Liepaja is influenced by Liepaja Lake, Tirdzniecibas Canal and the coastal area. The centre of Jelgava includes a vacant green area, built-up areas are located on the left bank of the river, the building structure of the right bank of the river is scattered between natural areas. There are several vacant or underbuilt areas and neighbourhoods located in Liepaja and Jelgava.

Aesthetic and ecological quality of green spaces in urban environments

The selected research objects were analysed in different groups: parks, squares, plazas and waterfront areas. Green spaces were compared using the obtained value in two directions – ecology and aesthetics, creating a graphic connection. The most varied and wide data were observed in the group of parks.

The comparison of green spaces of all four cities shows distribution of four groups according to the obtained natural and artificial values: natural green spaces with evident ecological values (1), green spaces, which obtained low rating in both directions (2), attractive human transformed green spaces with aesthetic values (3) and green spaces, which satisfy both – the needs of nature and human desire (4) (Fig. 3 and Fig. 4). The assessment carried out in the Thesis shows that the average value of ecological quality from 3 to 5 points and aesthetic quality from 1 to 3 points characterizes natural green spaces – with a bit transformed natural base and abandoned plantings (the first group). The group of green spaces with an average aesthetic and ecological rating 1 to 3 points includes problematic green spaces, which should be re-planned and improved soon (the second group). Those are different squares, parks and plazas with

a compositional design created in the Soviet period. It is necessary to perform spatial re-planning with a modern landscape design using native plant species in these areas. Such green spaces are very common in small and medium towns of Latvia.

The average aesthetic quality rating from 3 to 5 points and ecological quality from 1 to 3 points are typical to the transformed and human influenced green spaces, where hardcover dominates over the amount of vegetation (the third group). Green spaces with high aesthetic quality are different squares and plazas with limited ecological values. Ecological quality of the environment can be improved by the diversity of native vegetation (wild flower plantings) and certain areas that are left for wildlife, using the principle of visible stewardship. The last group includes green spaces of average rating with aesthetics and ecology from 3 to 5 points (the fourth group). They are aesthetically and ecologically balanced green spaces with a focus on sustainable and harmonious maintenance of environment and characterize the examples described in the Thesis. It is possible to use this complex assessment in selecting direction of development for specific green space in the future – natural green space or human transformed green space, to determine the most appropriate, beneficial and necessary landscape design for the city, taking into account the existing aesthetic and ecological values of an area.

*Planning of urban green spaces
in modern Latvian cities*

After carrying out the assessment of aesthetic and ecological quality of green spaces the author identifies three types of models that indicate the future development scenario of specific green space. The results outline three directions for landscaping of urban green spaces: 1) natural green space; 2) transformed man-made green space for areas with high anthropogenic load; 3) green space with use of landscape ecological design (Fig. 5).

The first model is characterized by wild plant species, feeling of untouched nature, use of natural materials in the design (wood, stone) in accordance with geobotanical region, different attraction places of wild animals. Informative signs for education and knowledge of visitors that include descriptions of current vegetation, wild animals and the importance of green space creating green structure of city should be placed. In such areas, if necessary, extensive care through the visual management is provided. This model is typical to parks because to create such planting there is a need for large area. The second model is the most common in the spatial landscape of Latvian cities. It is characterized by bright plantings (including diversity of annuals), wide use of foreign plants, artificial landscape design

elements, different synthetic materials (concrete, glass, polycarbonate, plastic etc.), large areas of hardcover. Regular intensive care and susceptibility to the impact of high anthropogenic load provided in this type of green spaces should be provided. This model is typical for plazas, squares, linear and geometrical parks, concrete waterfront areas. The third model is characterized by attractive native plant species (wildflower meadows), unique rare plants, landscape design that appreciate natural base, extensive care using the principle of visible stewardship. This type of green spaces is created as multifunctional landscape that provides operation of multiple ecosystem services, introduction of constructed wetlands, edible plant gardens, systems of water purification. This model is sustainable, restorative and regenerative. Each higher design approach requires larger material and financial investments for the creation of such green spaces, but their maintenance and upkeep consume less amount of energy than the maintenance of the second model in the force of high anthropogenic load.

The various groups of urban green spaces are characterized by different care and improvement. After the assessment of aesthetic and ecological quality of green spaces carried out in the Thesis connection between green spaces of selected cities and defined models was determined (Fig. 6). Selected cities are characterized by diverse green structure, which provides the presence of different types of green spaces in urban area. Selection of green spaces of four cities and their comparison revealed diversity of current green spaces within one city and necessity to conservation of this diversity and improvement of specific conditions. The knowledge acquired from literature review shows that development mission of green space is to preserve existing aesthetic and ecological values, searching for ways to highlight or connect them to the surrounding environment. The results of assessment of urban green space point out that inclusion of regional characteristics in landscape planning of green spaces of large cities is used incompletely.

Significant differences of assessment of aesthetic and ecological quality researched in the research in the context of four selected cities were not observed. However, there were some existing peculiarities of geobotanical region, topography and climate of an area and local architecture influenced by the location of the city. Major differences were detected by analysis of current vegetation and topography of green spaces. Landscape studies showed also minor differences of architectural space. All these determined regional characteristics influence the uniqueness and typicality criteria of the assessment methodology. Regional characteristics in the context
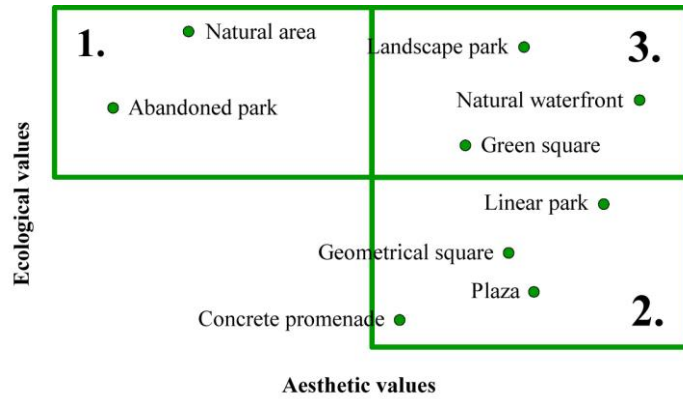
Fig. 5. Three development models of urban green spaces
[Source: created by M. Veinberga]
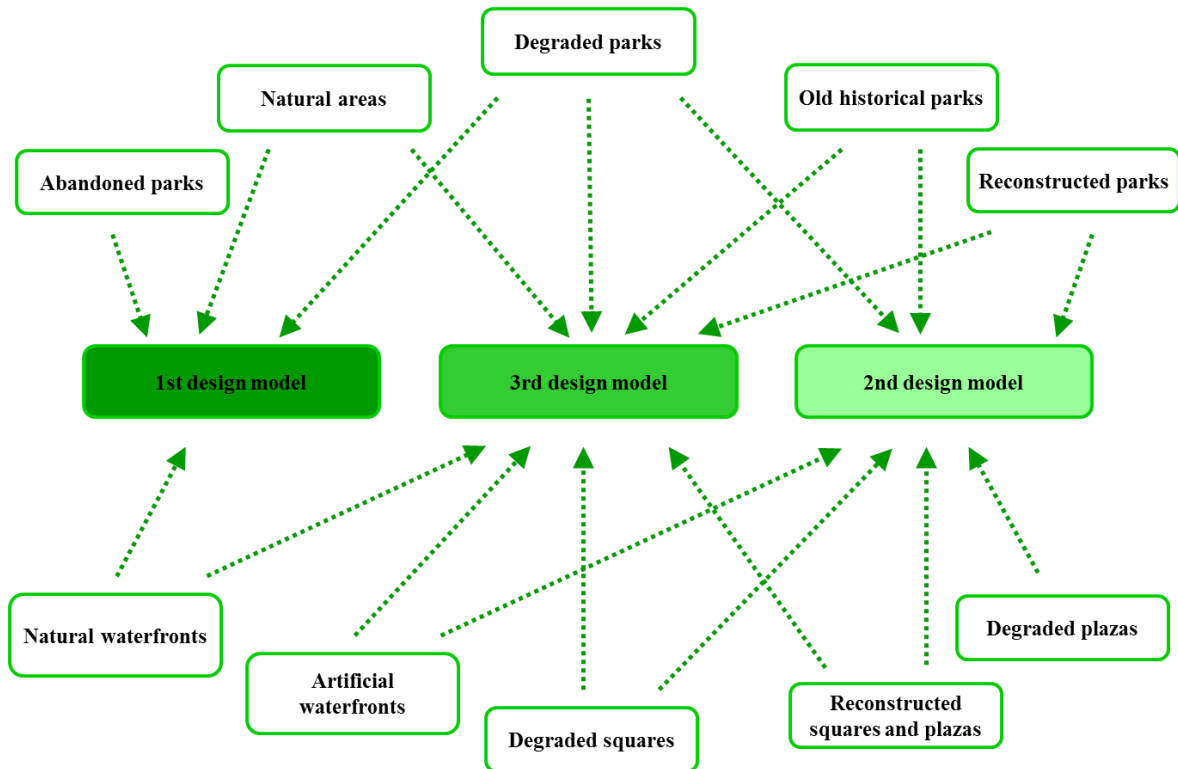
Fig. 6. The connection between development models and urban green spaces
[Source: created by M. Veinberga]

of culture and traditions of city residents in urban space were not observed as it could be observed in the studies of rural environment. The compositional and ecological character created in the Soviet period in the part of the green spaces has still remained. It was developed according to certain principles common to all Soviet Socialist Republics [23, 24]. By contrast, the main purpose of landscaping of new or reconstructed sites is fast and effective arrangement or maintenance of green space, using tested plant material and new landscape design elements [8, 11, 18]. Green spaces of selected cities do not characterize highlighting of local traditions, historic environment and regional architecture that was observed in foreign examples. In a number of selected cities the historical environment and architecture following the destructive wars have not been preserved to the present day. It influences and complicates restoration and development of historic and traditional environment of green spaces.

Conclusions

Green spaces selected for the study were divided in four groups according to the assessment of landscape aesthetic and ecological quality: (1) natural plantings with high ecological value; (2) plantings with a low ecological and aesthetic quality; (3) human transformed traditionally visual aesthetic plantings; (4) aesthetically and ecologically high-quality plantings.

Green spaces with higher ecologic and aesthetic values are parks and waterfronts with a system of regular care. The highest ecological values represent natural, unmanaged and abandoned parks. Green space with old and non-functional design has the lowest ecological and aesthetic quality indicators. Low ecological and high aesthetic values characterize green spaces with new utilities or regular renewal of materials and landscape elements.

Upkeep and maintenance of green spaces is characterized by three development models, depending on the location of the territory and the intensity of use in the urban environment. Spatial development models of green spaces are natural green space; green space modified in the result of strong anthropogenic load and visually attractive created green space containing ecological principles. The third option of green space models is the most attractive and pleasant in the perception of respondents. Three formulated scenarios in the result of assessment of aesthetic and ecological quality can be used in designing of individual development scenarios of green spaces.

In the aspect of aesthetic and ecological quality of Latvian urban green space, limited inherent regional differences appear for each city with regard to geobotanics, topography and architecture of green spaces, as well as minor differences of landscape preferences in the context of four different city residents. Green spaces of the large cities are designed in accordance with various laws and regulations and planning documents the priorities of which do not indicate the preservation of regional characteristics and the specifics of wild environment. The regional aspect in the context of city did not fully appear, as it is discovered in other rural or forest landscape-related research. However, the examples in the context of other cities around the world indicate that the regional context is an important creator of aesthetic and ecological quality, as well as local identity of green spaces, which should be emphasized in the planning of green spaces in the cities of Latvia.

Several guidlines can be drawn out of the results of this study for planning and design: to recognize that there are different types of urban spaces in the city and to hold on to these diferences, to highlight existing values of urban spaces, to maintain special features that are characteristic to this region or city, to draw attention to local plant species, to include different specialists in the planning process of urban area and to educate public in ecology, using different informative signs and activities.

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Kopsavilkums. Veiktais pētījums par pilsētu apstādījumu teritoriju estētiskajām un ekoloģiskajām kvalitātēm, norāda uz šīs jomas problēmu veicinošiem faktoriem un to risināšanas iespējām. Pētāmā problēma saistīta ar jautājumu – vai ekoloģiskie principi ir pietiekoši estētiski, lai tos varētu pilnvērtīgi izmantot pilsētas apstādījumu plānošanā. Latvijā lielajām pilsētām ir iespēja attīstīt apstādījumu sistēmas, izmantojot dažādus Eiropas un citu reģionu valstu finansējumu fondus, taču šo teritoriju attīstībai jābūt plānotai saskaņā ar dažādiem starptautiskajiem normatīvajiem aktiem, līdz ar to plānotajām teritorijām jābūt daudzveidīgām, ilgtspējīgām un labi pārvaldītām, nodrošinot kvalitatīvu dzīves vidi, gan cilvēkiem, gan citiem dzīviem organismiem. Pētījumā apskatītas pilsētu apstādījumu teritoriju attīstības iespējas, izmantojot esošās situācijas apzināšanu, kā rezultātā var noteikt esošo vērtību saglabāšanas un uzsvēršanas nepieciešamību, teritorijas attīstības virzienu kā dabisku vai mākslīgu, tāpat apstādījumu teritorijas uzlabošanas iespējas, lai tādējādi nodrošinātu daudzfunkcionalitāti konkrētās pilsētas un tās apkaimes kontekstā.

Izvēlētās pilsētas raksturo daudzveidīga pilsētas zaļā struktūra, kas nodrošina dažādu tipu apstādījumu teritoriju klātbūtni pilsētvidē. Šo četru pilsētu apstādījumu teritoriju izvēle un to savstarpējais salīdzinājums atklājis vienas pilsētas ietvaros sastopamo apstādījumu teritoriju dažādību un nepieciešamību pēc šīs daudzveidības saglabāšanas un atsevišķu apstākļu uzlabošanas. Atsevišķu apstādījumu teritoriju grupu analīzes norādīja, ka visplašākais un atšķirīgākais iegūto vērtību rezultāts ir parku teritorijām. Skvēru analīzes rezultāti ir līdzīgi, taču augu sugu daudzveidība un veģetācijas struktūra ir samazināta, ņemot vērā teritoriju nelielos izmērus. Vairāki analizētie skvēri ir novecojuši, un tajos saglabājies padomju laika plānojums. Tas ir atstājis ietekmi gan uz ekoloģijas, gan estētikas novērtējuma kritērijiem. Laukumu analīze norādīja, ka cietā seguma apjoms un telpiskā funkcija samazina ekoloģiskās vērtības. Savukārt mākslīgo elementu daudzums un kārtība norāda uz apstādījumu teritorijas kompozicionālo sakārtotību, labiekārtojuma kvalitāti

un ainavas sakoptību. Ūdensmalu teritorijas var būt gan dabiskas, gan mākslīgas, pateicoties krasta līnijas izmaiņām. Apstādījumu teritoriju novērtējuma rezultāti norāda, ka lielo pilsētu apstādījumu teritorijās reģionālo īpatnību ietveršana apstādījumu plānošanā tiek izmantota nepilnīgi.

Pēc veiktās apstādījumu teritoriju estētiskās un ekoloģiskās kvalitātes novērtēšanas ir noteikti trīs veida modeļi, kas norāda uz konkrētās apstādījumu teritorijas nākotnes attīstības scenāriju. Apkopojot rezultātus, iezīmējas trīs virzieni pilsētas apstādījumu teritoriju labiekārtošanai: 1) dabiska apstādījumu teritorija; 2) pārveidota apstādījumu teritorija vietām ar augstu antropogēno slodzi; 3) veidotas apstādījumu teritorijas, kurās izmantoti ekoloģiskie principi. Pilsētā esošo dažādo apstādījumu teritoriju grupas raksturo atšķirīga kopšana un uzlabošana. Apstādījumu teritoriju esošās situācijas novērtējuma estētiskās un ekoloģiskās kvalitātes kontekstā, tika noteikta četrās pilsētās, novērtējot esošo apstādījumu teritoriju sasaisti ar formulētajiem modeļiem.

New concepts in landscape architecture 1995-2015

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Abstract. **Analysing landscape architecture projects realized from 1995-2015, concepts of use and interpretation of water, representation variety of landscape patterns, giving new use and image to place, and vertical landscapes were recognized as balancing the need for images of nature with use of modern and innovative technology. In cases creating new or renovating landscape was used concept of representation variety of landscape patterns. Using linear park concept and small garden concept were created landscapes where space of democratic freedom was combined appropriate privacy. Concept of traces and islands based on lessons of history without regressing and concept of connections between historical threads that have inspired projects preserved cultural heritage landscapes. Concept of vertical landscape has rising interest from ecological and aesthetical aspects. Another theme is reuse of former industrial or dockland sites, old railways.**
    Keywords: concept, water, linear park, small garden, historical landscape.

Introduction

Landscape architecture – is landscape either natural (untouched), farmed (by farmers) or gardened (by homeowners)? –landscape architect is trained in the construction of scenery, in composition of landscape elements so that a harmonious view will be presented. With more reflection today landscape architects – in their work with roads, new built developments, tourist sites, forestry management, and so on – will make things appear to fit together, to put things in place, screening out the undesirable while preserving and framing the scenic moment [1].

    With in the field of landscape architecture, concept is a staring point, the general principle that guides thoughts, plans and designs [2]. A concept expresses in concise form, in words and images, the way landscape architects envising desirable developments in physical planning as well as the required type of intervention to achieve these [3].

    A concept formed during a design process can be defined as the creative and structuring moment at which the first designs arise. It is usually developed and visualized in sketch drawings [4]. The first search for design concepts is exemplified in Ian Hamilton Finlay's conceptual garden "Little Sparta" in Scotland: garden and sculpture exist in a site-specific and dialectical relationship, foregrounding the conceptual, symbolic, and allegoric facets of the history of landscape architecture [5].

Materials and Methods

Landscape remains an object of contemplation; it is presented (and conceived) as something to be beheld, typically from a distance. As such, landscape exists here largely as a visual image, a picture, albeit one that is dense with semantic value [6]. Analyzed landscape architecture projects realized from 1995-2015 were most recent concepts from landscape architecture critics and visited by author projects, in revealing analysis of the new directions possible for landscape design at the start of the twenty first century. Landscape architecture project concepts were analyzed using 3 actual for public questions:

How to make a landscape, balancing the need for images of nature with the realities of high technology?

How to create a space of democratic freedom which combines a social theater with the appropriate privacy and contemplition?

How to draw upon the lessons of history without regressing?

Results and Discussion

The concepts are brought forth in a multitude of scales and qualities. Many of the projects are working biological, social or aesthetic models; from storm water management to reconnection of the pedestrian to the urban network, from a play on infiltration of technology into our daily environment to molding contours that catch sunlight and cast shadow [7].

    The beginning of new solutions are to be worked for, but also in theory and practice, in experimental ways, because the fast pace of social change today makes long term development of serious planning and design strategies increasingly more difficult, and will make them almost impossible in the future. Beside the innovative, lasting designs – that are in no way mere traditional, ready made images that only need to be staged – temporary, experimental external space-

Fig. 1. Water stream in the residential area in Oslo Norway [Source: photo from author private archive, 2011]

projects with in a framework of landscape architectural symposia, landscape-artistic events an garden-exhibitions will become even more important in future [8].

For balancing the need for images of nature with the realities of high technology in landscape were recognized following concept groups: concept of use and interpretation of water, concept of representation variety of landscape patterns, concept of giving new use and image to place.

Knowledge of material properties and processes is fundamental to innovation in design applications. Conceptual and practical approaches to design development and dialogue have shifted toward a research-driven design process in which the opportunities and constraints of materials and construction techniques become integral to design intent [9].

Most dominated among projects was concept of use and interpretation of water. Sound of water has been so unconsciously attractive to humans of all cultures at all times. It can make us hear silence, and not only the silence after or between sounds, but the silence with and beyond all sounds. We

experience something of our own original nature, with and beyond all form and non-form the sounds of a gunshot, a jet plane are hardly conducive to such experience [10]. Usually parks consist of several individual systems, the lowest of which, the water system. Special concept was developed for the water park of a still-water system fed by rain water. From streets, roofs and squares the rain water is channeled to the water park. Collection and use of water is visible in every situation, and as far as possible (Fig. 1).

Concept of momentary, daily and seasonal cycles of ephemeral forces such as wind, rain, fog, clouds, light, sound and temperature animate the landscape with a vast array of experiential conditions [11].

Important becomes concept of diverse biological and visual system of water ways. Proposed profile contains different water zones [12]:

- planted bank area (10–50cm);
- normal zones (50–200cm);
- deepzones (up to 250cm) for settling;
- gravel and sand banks.

An extensive storm –water management system using indigenous riparian habitats is the spin of the
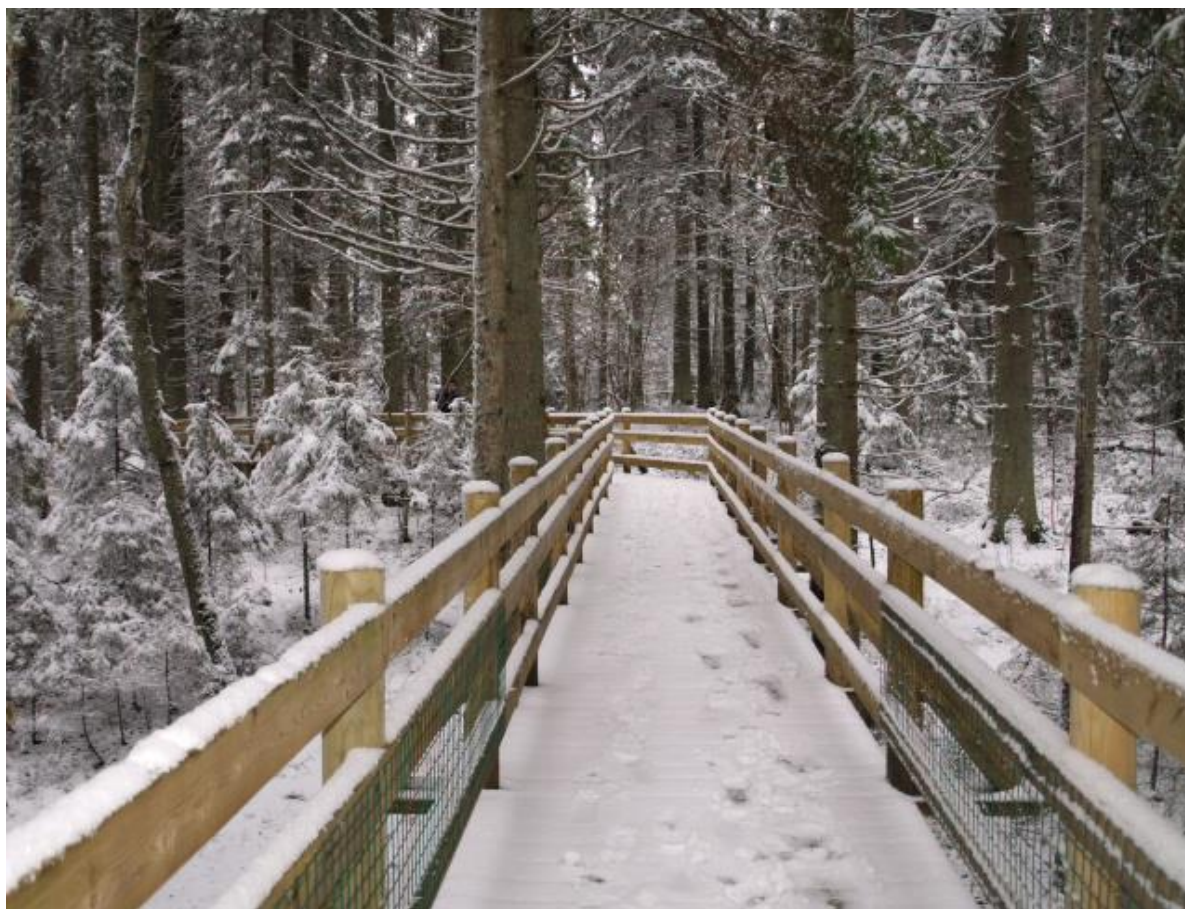
Fig. 2. Nature trail in forest area in Ligatne Nature Park Latvia [Source: photo from author private archive, 2012]

open space system, and is fully integrated into the recreational facilities. In another cases the straight line of the embankment is fragmented by different types of vegetation. Methods of small scale, local water retentation, and infiltration begin compensate for the depletion of natural spongy structures (soil, wetlands) [13].

Creating new or renovating landscape traditionally was used concept of representation variety of landscape patterns. In designing parks and public spaces were used specific local areas in landscape. Nature represented a harmony of pattern and process, form and function, at all scales. Each scale interlink with the next forming an integrated and naturally ordered whole, organization exists in space and time [14]. The scheme will be a sequence of cultural and recreational venues following the course. As well as giving shape to the landscape, the river, for example, also divides it, and the scheme's most significant contributor will be uniting of the two embankments in the form of a suite of bridges [15].

Landscape architecture now reoriented to serve communities in the new industrial towns and to realize ideas of wilderness protection and agricultural development for society as a whole [16]. Using this concept the design was governed by following principles:

- the design would grow out of the inherent qualities of the place – the biome, region, the local plant communities and habits, and reflect the cultural history and indigenous architecture of local woods;
- all design thematic structure, site organization, interpretive paths, plant displays, architecture and even site management techniques – would reveal the major natural processes and express the evocative qualities of this place.

Planting design would celebrate native plant communities and reflect the architecture of nature – the underlying structure and organization (expressed as pattern) of each plant community type (Fig. 2) [17].

It is important to mention how valuable local peoples knowledge, creative paths and natural links in an increasingly globalized world are. It is a remarkable piece of evidence. Beauty we translate now as the voice of art, in shaping nature

jointly in environmental and aesthetic ways [18]. View landscape as a scene for unconventional exploration, yet they share an urge to link site conditions to ecological and cultural contexts by unusual programmed interpretation, use of materials and form composition. Visitors are invited to proceed the visual detail of each project and open dialogue between site and context, between process and performance, between sensation and memory [19].

Another challenge is the balance between more or less maintenance-free landscape architecture, and projects that require daily care and attention [20]. Concept recognizes the temporal dynamism of landscape systems and requires that maintenance unfolds as a series of choreographed performances throughout the lifecycle of a landscape site [21].

Rising interest in vertical landscapes, such as hanging gardens, tensile vine structures, and multi-tiered green facades [22]. Vertical landscapes also represent a conceptual shift toward a synthesis between landscape and architecture [23].

For the concept of giving new use and image to place the central idea is to adapt the purposes of the structures. It might seem absurd to compare elements of park to the alps, but climbing paths across the masses of concrete do give that impression and are used for training [11]. It is possible to use the brutality of architectural intervention in landscape as a means of confrontation, but it can also be reduced by methods of adapting and masking. One possibility of bringing the architectural body into connection with the landscape is interconnection. This process requires the architecture to dissolves into structures on the periphery of natural spaces that thrust in to vegetation and are overgrown by it in the course of time. Objects, space and place have very different psychological annotations. Buildings as objects basically demand attention and admiration, buildings as space are initiations to enter, buildings as place are occasions to participate [12]. As Jan Gehl proclaimed first life, then spaces, then buildings – the other way around never works [26].

In some cases the stone coins would be elevated to provide seating or reflecting pools, and elsewhere they are flush to the ground with an infill pattern of small granite stone. Fine grasses will be planted between the stones, and as the many visitors stroll through the gardens, paths will be worn into the refined surface while other areas will be left lush and green. This plan had to expand the traditional concept of master planning to create a bridge between the site and its interpretive possibilities,

between scientific and artistic expertise and between a wide variety of specialists [27].

Another theme, clearly identifiable, is reuse of former industrial or dockland sites in Denmark, Sweden. Iconic the more recent landscape park Duisburg Nord, designed by the German practice, Latz + Partner, turned a steelworks with blast furnaces and bunkers into award-winning park [28].

Contemporary landscape architecture is characterized by the reintroducing of contrasting colors and the contrast created by introducing urban forms and materials in rural settings. It must be a place for social, contemplative, and recreational use [29].

Realization of space of democratic freedom which combines a social theater with the appropriate privacy and contemplation are realized in linear park concept and concept of small gardens. The linear park opens pathways to diverse neighborhoods and new recreational spaces and experiences of nature; it invites exploration of alternate modes of transport and of cultural resources. It weaves connections between city and suburb, suburb and country, between nature and culture, among people of different origin, age, sex.[30]. Linear park is answer to the increasing cultural isolation and physical separation in which we often find ourselves. Practical park management considerations, such as maintenance, safety and accessibility, also argue in favor of the linear park. Because of the forms permeability and continuity, the linear park avoids the hazards occasioned by the isolation and disconnection so frequently encountered in many traditional urban parks.

Multiply the destinations, give them panoply of urban, rural, cultural and natural possibilities and this new park becomes a promenade with enormous civic potential [31]. Concept is the merging of landscape and communication: an evolving representations of local and contextual conditions. Methods that elucidate and describe both invisible conditions and occurrences over time [32].

Concept of small gardens in large projects becomes important because gardens are resting places, where people can confront large dimensions with a small spaces. The picture to which these frames ultimately refer is received arcadia. For example, each room sought to [33]:
- illuminate the meaning of the sun and sky;
- identify place in relation to specific times of the day, and season;
- bring the botanical and biological environment into focus;

Fig. 3. Water stream in the small garden in Keukenhof Netherlands [Source: photo from author private archive, 2011]

- express the specifics of the unique place and region;
- reveal the beauty in the currents, reflections, and moods of water;
- reflects on past history.

Here garden means the occupation of individuals within the existing fabric and learning about the environment and vegetation with the help of intellect and hand (Fig. 3). It is an archetypal for of discussion, one of human society with nature [17]. Landscape architecture is profession dealing with the interdependence of environmental processes [35].

Success of garden festivals is points to a new understanding of the garden as a vehicle of contemporary investigation, promote experimentation, established the right to freedom in garden design [36].

The proposed open spaces integrates various uses, such as golf courses, bike paths, trails and several distinct park types, such as traditional green community parks, active sports centers and natural parks. The built public sphere, that intersection of space and information [37].

The lessons of history without regressing included in concept of traces and islands and concept of connections between historical threads that have inspired project.

With idea of cultural landscape; defined by ICOMOS as'the conviction at dealing with landscapes starts from a consideration of human values, and that there are no objective criteria for determine importance. All interventions should remain traces and islands in the total landscape continuum [38].

In concept of traces and islands landscape architect interprets the structures and spaces, regardless of the historic function they may have had. Such a garden, with its emphasis on utility, clearly has its direct ancestors not in the aesthetic tradition of garden design. But in the Victorian parks and gardens schemes which provided the general public with open spaces for recreation and entertainment. These gardens borrowed some of their aesthetic appeal from private landscape gardens (more usually the formal elements).they were essentially designed as places for people to go and do things in, rather than to contemplate nature [39].

Concept of connections between historical threads that have inspired project used for old unused railway track revitalization. They are spreaded over the landscape, establishing new relationships with the surroundings. Situated mostly on high dams, they offer the local people a panorama of the urban landscape which previously denied to them [40]. Design concept demonstrates connections between many of the disciplines and historical threads that have inspired the work. For example, the internal patterns of various fields of the gardens, composed of grasses and local gravel, contain individual and distinct order in striped, zigzag and radiating patterns that reflect both ancient decorative motifs and the contemporary pictorial elements of works of artists [41].

For forward looking place-makers of today, the value of the site's story is more important than formal and compositional concerns [42].

Natural and cultural landscapes are considerable attractions in terms of recreation and tourism but must be ensure that such development does not damage the existing character of the landscape [43].

Site remediation techniques for the treatment and reclamation of post industrial residue or disturbed ecologies have been used [44]. Green infrastructure is a social tool, where it takes on invisible implications of cultural symbolism in addition to its physical manifestation. Landscapes that read as signs carrying ideological messages have lost ground to place-making as networks where people move and interact, as platforms for aspirations [45].

Even the most avant-garde of contemporary landscape architects is still likely to be preoccupied with scenic construction, albeit perhaps of an eccentric, seemingly abstract order. And here, of course, lie the contentious issues of taste and style that have been intrinsically associated with landscape affairs since the seventeenth century, issues that remain embedded most deeply in local and regional conflicts between preservationists (heritage groups) and entrepreneurs (whether of economic, programmatic or artistic/creative impulse) [46].

Thus, many landscape architects have found a role to play in contemporary society that mirrors exactly what the above – imagined layperson would expect: they have emerged as scenic (and, increasingly, ecological) mediators, aiding in development while screening out (rendering invisible) its effects [47].

Conclusion

A concept expresses the way landscape architects design developments as well as the required type of intervention to achieve these. In general recent landscape architecture concepts are working biological, social or aesthetic models. Aims and ideas were from storm water management to reconnection of the pedestrian to the urban network, from a play on infiltration of technology into our daily environment to molding contours that catch sunlight and cast shadow.

Beside the innovative, lasting designs temporary, experimental external space- projects with in a framework of landscape architectural symposia, landscape-artistic events and garden-exhibitions will become even more important in future.

Landscape architecture now reoriented to serve communities and to realize ideas of wilderness protection and agricultural development for society as a whole. Planting design would celebrate native plant communities and reflect the architecture of nature – the underlying structure and organization.

Analyzing landscape architecture projects realized from 1995-2015, concept of use and interpretation of water, concept of representation variety of landscape patterns, concept of giving new use and image to place, concept of vertical landscapes were recognized as balancing the need for images of nature with use of modern and inovative technology. Creating new or renovating landscape was used concept of representation variety of landscape patterns. Dominated among projects was concept of use and interpretation of water.

For the concept of giving new use and image to place the central idea is to adapt the purposes of the structures. In designing parks and public spaces were used specific local areas in landscape. Linear park concept and concept of small gardens created landscapes where space of democratic freedom were combined a social theater with the appropriate privacy and contemplitation. Linear park concept is answer to the increasing cultural isolation and physical separation. Practical park management considerations, such as maintenance, safety and accessibility, also argue in favour of the linear park. Concept of small gardens means the occupation of individuals within the existing fabric. Garden festivals are points to a new understanding of the garden, promote experimentation. Concept of vertical landscape, such as hanging gardens, tensile vine structures, and multi-tiered green facades, have rising interest from ecological and aesthetical aspects. Another theme, clearly identifiable, is reuse of former industrial or dockland sites, and green

infrastructure is recognized as a social tool. It must be a place for social, contemplative, and recreational use.

Contemporary landscape architecture is characterized by the reintroducing of contrasting colors and the contrast created by introducing urban forms and materials in rural settings. View landscape as a scene for unconventional exploration, yet they share an urge to link site conditions to ecological and cultural contexts by unusual programmed interpretation, use of materials and form composition. Beauty we translate now as the voice of art, in shaping nature jointly in environmental and aesthetic ways. Natural and cultural landscapes are considerable attractions in terms of recreation and tourism.

Concept of traces and islands based on lessons of history without regressing, but concept of connections between historical threads that have inspired project. New design concepts in landscape architecture demonstrate connections between many of the disciplines.

New solutions are to be worked for in theory and practice, but also in experimental ways, because the fast social change today makes long term development of design strategies more difficult. Landscape architects have emerged as scenic (and, increasingly, ecological) mediators, aiding in development while screening out (rendering invisible) its effects and have found a role to play in contemporary society.

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Kopsavilkums. Analizējot publicētās ainavu arhitektūras kritikas un autores apmeklētos projektus, kas realizēti periodā no 1995. līdz 2015. gadam, kā galvenās izdalāmas koncepcijas par ūdens lietošanu, ainavu daudzveidības demonstrēšanu, jaunu pielietojumu un tēlu veidošanu teritorijām, vertikālo ainavu veidošana. Šīs koncepcijas atklāja kā ar modernu tehnoloģiju pielietojumu sabalansēti var saglabāt dabisko ainavas tēlu. Veidojot vai renovējot jaunas ainavas, plaši tiek pielietota koncepcija, kas reprezentē ainavas daudzveidīgo rakstu. Tomēr dominējošā vietā ir ūdens interpretācijas koncepcija, vismaz kā viena no projekta slāņiem.

Ainavu arhitektūras projektos koncepcijā nosaka projekta galvenos dizaina principus un norāda ar kādiem tehniskajiem paņēmieniem to var realizēt. Mūsdienu ainavu arhitektūras projektu koncepcijas ir darbojošies bioloģiskie, sociālie vai estētiskie modeļi. Koncepciju mērķi un idejas variējas no lietus ūdens menedžmenta līdz gājēju drošība nodrošināšanai un no spēles ar ūdeņu infiltrācijas līdz gaismu un ēnu modelēšanai. Blakus inovatīviem ilgtspējīgiem risinājumiem būtisku nozīmi ieguvuši ainavu arhitektūras simpoziju un izstāžu eksperimentālie dārzi, kuriem ir nozīmīga nākotnes ietekme. Ainavu arhitektūra šodien orientēta kalpot sabiedrībai un realizēt idejas, kas saglabā dabisko vidi un attīsta lauks visas sabiedrības labklājībai. Augu dizainā kā galvenais ir dabiskās augu sabiedrības un to struktūra.

Koncepcijās, kurās tiek veidots jauns vietas izmantošanas veids un tēls centrālā ideja ir apgūt dažādu struktūru pielietojumu. Parku un publisko telpu dizainā cenšas lietot specifiskas lokālas teritorijas ainavā. Lineārā parka koncepcija un mazu dārzu koncepcija rada ainavas, kurās eksistē telpa demokrātiskai brīvībai ar vienlaicīgu sociālā teātra un nosacīta privātuma efektu.

Dārzu festivāli ir sākuma punkts jaunai izpratnei par dārzu un veicina eksperimentēšanu. No ekoloģiskā un estētiskā aspekta ir pieaugoša interese par vertikālo ainavu koncepciju. Vēl viena būtiska tēma ainavu arhitektu praksē ir iepriekšējo industriālo un ostu teritoriju pārveide, kā arī zaļās infrastruktūras pielietojumam kā sociālajam rīkam.

Kultūrvēsturisko ainavas elementu saglabāšana bez to vērtības mazināšanas ietvertas koncepcijā par dažādu vēsturisko iezīmju un salveida ainavu saglabāšanu un koncepcijā par vēsturisko iezīmju savstarpējo saistību ainavā, kas reizē kalpo arī kā iedvesmas avots projektā.

Visās aplūkotajās koncepcijās ainavu arhitekts darbojas kā vizuālais mediators, pieaugot ekoloģiskajam aspektam, projektā redzamus izceļot ainavas efektus vai gluži pretēji nevēlamos maskējot. Ātro sociālo pārmaiņu dēļ, ilgtermiņa dizaina stratēģijas mūsdienās ir arvien grūtāk realizējamas, tādēļ tiek piedāvāti arvien jauni risinājumi gan teorijā, gan praksē, gan eksperimentālā veidā.

Saulkrasti – Neibāde, Pēterupe and Katrīnbāde

Jānis Zilgalvis, *a full member of Latvian Academy of Sciences*

Abstract. The architectural heritage of every site is of value, whether it is a well-known tourist destination or a less known site. But an in-depth study often draws attention to sites that have not previously been well-known and, thus, over time they are brought to light as long forgotten pearls.
Keywords: architectural heritage, monument protection and preservation, landscape architecture.

Chapels and the Churches

Pēterupe Church dates back to the beginnings of the 30s and 40s of the 13th century**,** when the river was called the river Tarve and the congregation - the Tarve congregation [1]. More specific details of the congregation have survived from the middle of the 17th century, when in 1641 a new wooden chapel was built and named after St. Peter. Supposedly, the place name is also derived from it. This place of worship was surveyed by the Swedish land surveyor Olof Bergman in 1692 [2]. The facade and the plan were depicted there, as well as information was provided about the items in the building. It was quite small, with an almost square area of the congregation room, lit on each side by only one window opening. The altar apse with a polygonal closure was adjacent to the the congregation room. It was also lit by a window opening on each side. The facade drawing also provides information about lighting of the building. The congregation room has a steep pitched roofing, the altar apse has the same roof, only with a tapered end. Above the the roof of the congregation room at the end of the main entrance, a very small polygonal turret with a pyramidical spire rises. It should be mentioned that the window openings, consisting of two parts with a semi-circular lintel – a kind of memory of the Romanesque times.

For a long time, Pēterupe was a branch of different congregations. The church was left without a pastor in 1710, and in 1718 the Krimulda Pastor - Dean Johann Heinrich Hilde began to work there. In this small fishermen's congregation, the church services were held only every sixth Sunday. For a short time, another Krimulda pastor worked in Pēterupe – Johann Justus Grűner, for whom the way to church seemed too far away from his home. In the visitation documents of 1726 and 1727, it is mentioned that the church can be used only in good weather conditions, but on rainy days the church services take place in the pub. In 1735, a new church, also wooden, is consecrated. Johann Christoph Brotze [3] has placed its pictures in his collection of drawings. In the first drawing, the church is visible in the view from Pēterupe. It is slightly larger than the previous one, the congregation room is lit by broader multi-paned windows, a small Baroque turret rises above the ridge. Opposite the main entrance, a small fence with a gate can be seen. The second picture is drawn by Johann Wilhelm Krauze, later a professor at the University of Terbata. He has also left notes on residents of the Pēterupe congregation, among other stories - on fishing with them. A*ccuracy and dexterity with which they executed their leader's orders, deploying nets, maintaining the distances, directions and rowing the same way, opposed the defamation of the Latvians for not being helpful. The job was not repaying, but the brave folks did not complain; here they are more happy of the opportunity to show their strength, talent and agility ... They are really honest people, dressed in the mariners' fashion, well-off, with a strong, stubborn glance and the presence of their lord who has also participated in watching of fishing, not at all confused, as it is usually with peasants. Almost all have short, narrow, blue coats with silver buttons and a subtle red, black or yellow scarf round the neck after the mariners' fashion ...* [3]. It seems that a theatrical performance is organized for the artist, especially in respect of clothing. The church drawing of J. V. Krauze is more romantic than that drawn by J. K. Broce. The main attention is focused on the natural environment and landscape. The foreground depicts a bridge over the river Pēterupe, but the volume of the church is visible only in one corner,
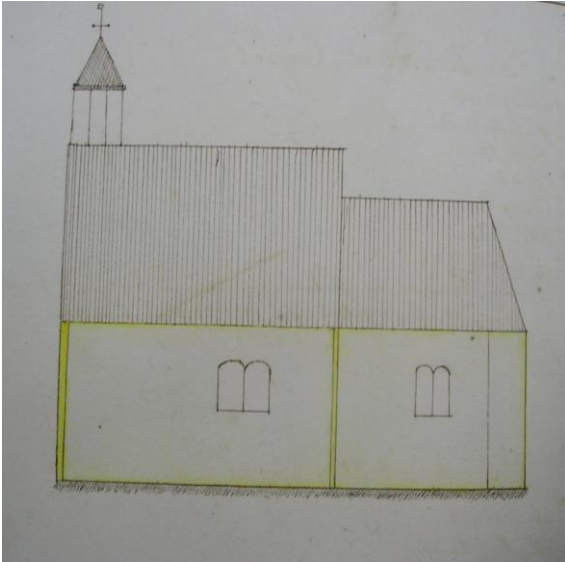
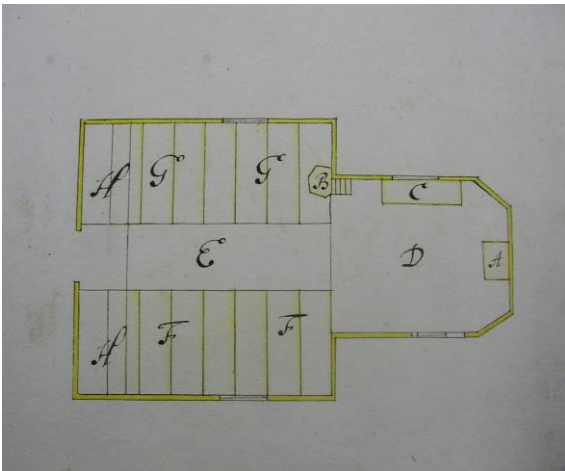Fig. 1. Pēterupe Lutheran Church [Source: Latvia State Historical Archive, 7404, f., descr. 1. p. 2063]

Fig. 2. The plan of Pēterupe Lutheran Church [Source: Latvia State Historical Archive, 7404, f., descr. 1. p. 2063]
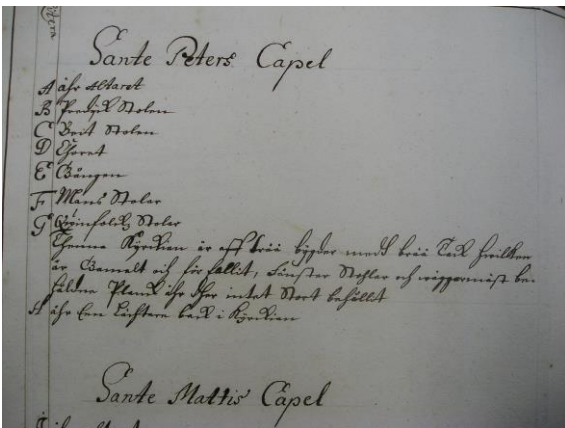

Fig. 3. The key to the plan of Pēterupe Lutheran Church [Source: Latvia State Historical Archive, 7404, f., descr. 1. p. 2063]

partially hidden behind the foliage of the trees. In this drawing, the spire of the church tower is Baroqually graceful, but in the drawing of Broce it is simpler.

From 1737, the Lēdurga pastor Hase undertakes to serve in Pēterupe, but in two years he dies. Later his job is taken over by the Liepupe pastor Johann Christoph Gericke.

The visitation protocols of 1739 provide information about patrons and equipment items [4]. They mention that the patroness was baroness von Mengden, born Taube. There was a copper baptismal font, zinc cup with a wafer platter, altar cloth, red altar cloth, and one white altar cloth, two zinc lamps, a purse with bells and one bell.

In the course of time, the old wooden church was in a poor technical condition, so instead it was proposed to build a new church. From today's point of view, what would the benefits of our cultural history be if this old church of the 18th century were repaired as elsewhere? But the time and fate have destined otherwise for many buildings, including these in Pēterupe to make room for a new construction.

The new church, as tells the memorial plaque bricked into the wall of the parish room, was built in 1856 by the owner of the Bīriņi manor - Lieutenant Colonel August von Pistohlkor. In fact, the construction of the tower of the church was completed in this year, but the congregation room was built in 1864 and in the same year the church was consecrated, able to hold 250 seats. The new church had a wide congregation room lit by paired window openings with semi-circular lintels. The bell tower was raised in the part from the main (final) facade and surmounted by a pyramidical spire. In the plan, the altar apse is square and on both sides vestries are additionally built. Stylistically, the building roots in the Romanesque style, but the common spirit in this sense is very reticent. The profiled roof eave is very simple, the tower facade is decorated, using a demure arcature theme and that's it! However, greater attention is focused on the outside of the main entrance. Here, a wide staircase with support walls is installed, in which balusters are visible (1938, arch. V. Ozoliņš).

The church appears in several historic photos. Compared with the situation today, much has changed. The former romance, looking to the church across the river Pēterupe, is lost. The view from the altar end was also different, the adjacent buildings added the scale effect to the church.

Fig. 4. Pēterupe Lutheran Church
[Source: Johann Christoph Brotze. Drawings and
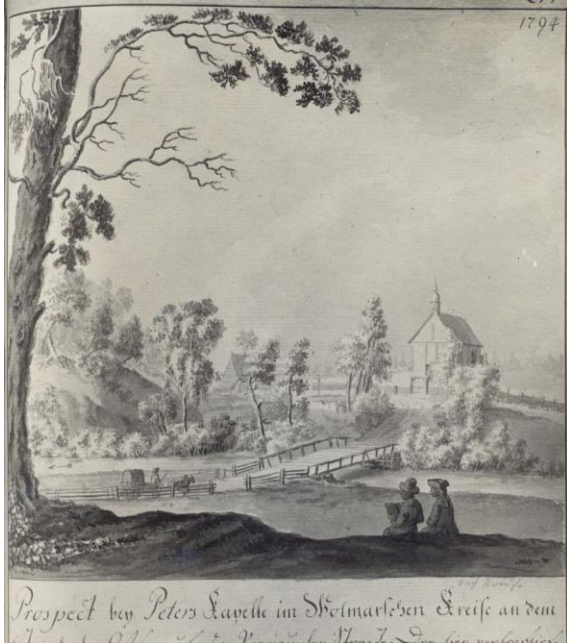descriptions. Riga, 2002. - Vol. 3, p. 180]

Fig. 5. Pēterupe Lutheran Church
[Source: Johann Christoph Brotze. Drawings and
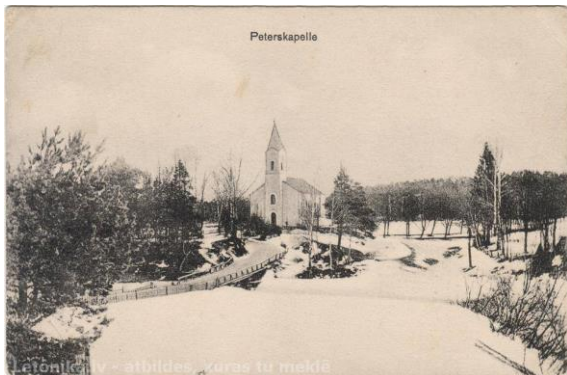descriptions. Riga, 2002. - Vol. 3, p. 182]

Fig. 6. Pēterupe Lutheran Church
[Source: Letonika.lv, 1920s]

Fig. 7. The pulpit of Pēterupe Lutheran Church
[Source: photo by author, 2012]

Fig. 8. The altarpiece of the church
[Source: photo by author, 2012]

It is now lost, although the common spirit is preserved.

One of the church's most valuable items of the equipment is the pulpit. The panel paintings of its casing are either lost or pained over (the first half of the 18th century). The pulpit door panel is retained as a memento of the old Pēterupe Church, which depicts St. Peter. He is barefooted and holding a key. He is painted in full height, dressed in a long reddish-brown gown, supplemented by a cloak. In dark brown tones, on the pulpit caret ceiling, the symbol of the Holy Spirit – a dove is painted.

At the south wall of the church, the molding of the coat-of-arms of the churche's patron and builder A. Von Pistohlkors in an ornate frame of acanthus leaves can be viewed. The memorial plaque placed at the south wall also gives evidence of this time. It bears an inscription: *in memory of the soldiers of the Pēterupe congregation fallen in battles for Latvia's freedom and independence. We loved you, my dear homeland! We guarded you in the severe hour! For you we went through torments and died... Homeland, homeland, are you still here? November 18, 1933, Pēterupe Congregation.*

The retable of the altar of the church is decorated with the altar painting *Golgotha,* which is painted with oil paints on canvas. The author of the painting is Josef Műller, who painted it in 1856, using the altar painting of Ludwigskirche in Munich as a source of inspiration, the author of which is the painer Peter von Cornelius. In the center of the painting, the crucified Jesus is depicted, at both sides of whom two convicted thieves can be seen.

On either side of the altar, stained glass can be seen in the window openings of the Soviet time photos [5]. Now it is no longer here. The church interior is complemented by an organ built by the organ master August Martin from Erfurt in Germany, which was started to be used in 1865. In 1917, the Russian soldiers completely devastated it. Later, the organ was restored with the care of Ivars Strautiņš, the President of the Latvian Central Cooperative Union *Turība.* And with the assistance of the international cooperation from England, the Saulkrasti church has in its possession an approximately 100-years-old organ. The local pastor Vaira Bitēna, the archbishop e*meritus* Ēriks Mesters and the Valmiera district priest Andrejs Kavacis participated at the solemn ceremony of the inauguration. At the solemn worship, the organ was played by Tālivaldis Deksnis,

Fig. 9. The epitaph of A. A. von Pistohlkors
[Source: photo by author, 2012]

Fig. 10. The congregation room of the church
[Source: photo by author, 2012]

but Juris Karlsons, the rector of Jāzeps Vītols Latvian Academy of Music had the opportunity to listen to his own compositions [6].

In particular I would like to mention the epitaph of limestone with a dark colored silhouette of a woman. It depicts the premature death of Auguste Amalie Pistohlkors in 1854. She was born in 1839 in Riga. The following lines are devoted to the gone girl: *let the angel who went to the sky home stay there for a while, for young souls who walk as if in front of the Lord's cheek.* It is found that in fact the person was born in 1809 [7]. It is not known where this information comes from.

Fig. 11. Pēterupe Lutheran Church [Source: photo by author, 2010]

The church also has a number of movable monuments of art. The Soviet-time photos show two chandeliers – one with candles closer to the altar, the other with six domes located closer to the middle of the congregation room. The last one would be the subject of the 1930s. The brass ceiling lamp was stolen during the Soviet time. Are the panel paintings of the pulpit also lost? Today, the congregation room is lit by a chandelier with 12 domes.

Rectory

The rectory of Pēterupe is located some distance away from the church - in the bent of the river Pēterupe on the other side of the railway. If the church itself is a fairly modest building, then it cannot be said about the manse. It is a rather large two-storey building with a steep pitched roofing. It appears in several of the 1930s photos. At the main entrance, a wide two-storey loggia, glassed from the sides, is additionally built. The railing has silhouette carvings, the windows have a six-pane division. The manse stands in its original place even today. Unfortunately, it is lined with plastic finishing boards, and *Rannila* tin roofing is installed. The porch and the external image of the building are gone, compared to the historical evidence, weakly saying, it is destroyed. The windows are new, and, perhaps, the ancient building has been extended over time, creating a new entrance at one end. It is evidenced by the comparison of the ratio with the historical pictures and the situation today.

The former patron of the church asessor Samson turned the manse into a pub and in this time the pastor Hilde rented the land - ½ to the pub keeper, ½ to teachers. In 1730, the landrat and the superior of the church G. von Budberg ordered to build a new rectory to the new parish patron, the landrat and the general lieutenant K. F. Mengden. This work, however, was not started.

The Neilanda alley, planted by the pastor and the literary figure Jānis Neilands (1840-1915) in 1879, tells about the history of the rectory. He was an active translator of spiritual songs, a piler of the ancient Latvian spiritual literature, the director of the Latvian Association of Friends in the Vidzeme district. He described his household and his arrival in Pēterupe in the autobiographical novel *My Youth Time* [8]. The Knirim oak, planted by the pastor and the linguist Johann Wilhelm Knirim (1805-1869), also tells about the history of the parsonage.

Fig. 12. The panel of the pulpet door of the church
[Source: photo by author, 2010]

Fig. 13. The congregation room of the church
[Source: State Inspection for Heritage Protection
of the Republic of Latvia,
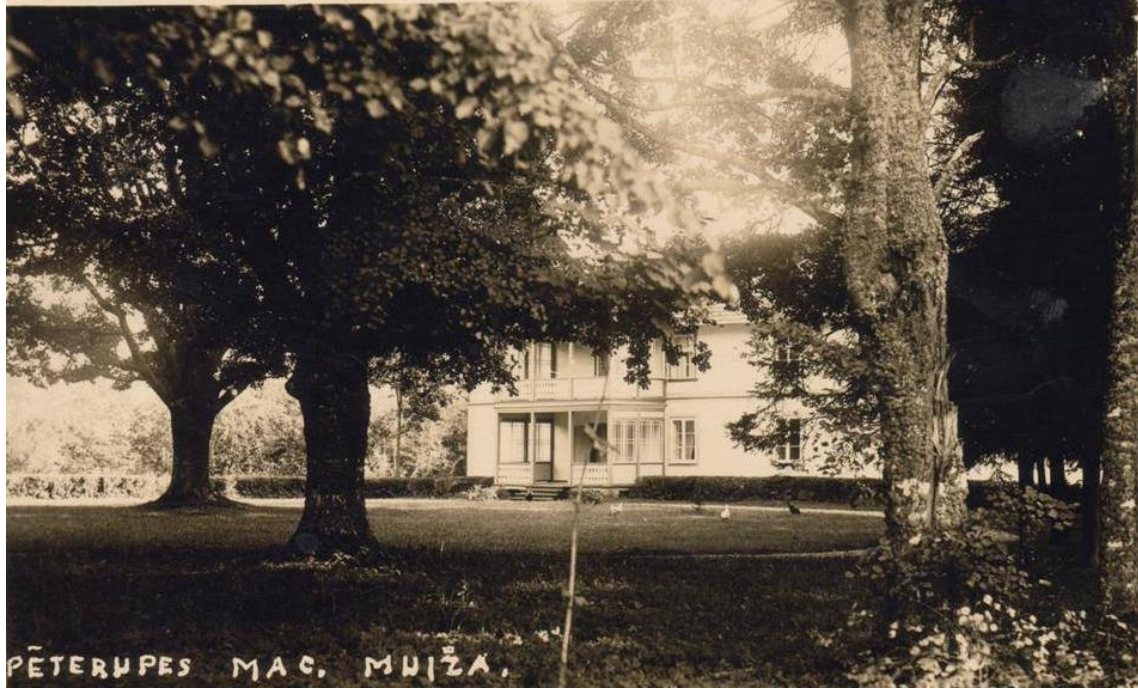Monument Documentation Centre, 1970s]

Fig. 14. The rectory in Pēterupe [Source: Letonika.lv, 1930s]

Fig. 15. A peculiar stone, which was found in the foundation
of the cattle shed of the rectory
[Source: photo by author, the end of the 1980s]

From 1895 until 1931, the pastor Jānis Stāmers (1859-1940) served as a priest in the congregations of Pēterupe, Skulte and Carnikava. He owned a villa Meeresruh in Pēterupe, built around 1890. This building was visited by many notable people, such as the composer Jāzeps Vītols. In his memoirs, it is mentioned that together with the pastor they played the piano and walked along the coast. In Pabaži, Stāmers owned a boarding house *Katrinbad*, consisting of two summer cottages. He managed them in summers and rented them to holidaymakers [9].

In 1980, the catle shed of the rectory was demolished. It was a log house with a high stone-wall ground floor, as such structures come to be. During the demolition, in which the author of this article also had the opportunity to participate, all the historical evidence was fixed. Among them, there was a log house of impressive dimensions. In the foundation of the building, a strange small boulder was found, maybe an earlier testimony from the primitive deity times, which found its place there in order to eliminate *false beliefs*. And another moment – through the demolition of the building, a blue stained glass cast in sand was found in the foundation. It is not known who had packaged these fragments so carefully. These fragments are now incorporated into the new stained glass in the house of the author of this article at Katrīnbāde.

Fig. 16. The manse of Pēterupe
[Source: photo by author, 2002]

Fig. 17. A monument to the founder
of the Neibāde resort K. Von Reitern
[Source: photo by author, 2012]

The resort's history and the historic buildings

Neibāde – one of the most prominent and oldest bathing areas in Latvia, in 1823 was founded by the owner of the Lēdurga manor Karl von Reitern. In 1877, due to this event, in his remembrance, the owner of the Bīriņi manor August von Pistohlkors placed a vase on a high podium in his respect and gratitude. It also appears on the podium and its inscription: *Gedächtnis Stätte dem Gründer von Neubad Karl von Reutern zu*

Loddiger in verehrung u. dankbarer Erinnerung errichtet von August von Pistohlkors zu Koltzen 1877. This monument is situated in the present Saulkrasti park not far from the stage. In the times gone by, there were spa houses, restaurants, boarding houses, orchestras arrived from Riga, balls, theatre performances and amusements were organized. For example, in 1836 the German newspaper *Das Inland* reports of *Sontag Bälle in Neubad Statt*.

During World War I, most of the cottages and boarding houses were devastated. The resort building was generally equivalent to the historical building of the city of Jūrmala. Little has survived and it is especially collectible to preserve information about the former times.

At Kalniņa iela 10, the house *Forstei* of the owner of the Bīriņi manor von Pistohlkors can be seen. Probably, it is one of the first summer cottages in Neibāde, also called Mežmuiža, because the forester lived in this house. In 1937, the composer Alfrēds Kalniņš spent the summer there. The building is a local architectural monument. In turn, at Raiņa ielā 6, the doctorate of Pārlielupe is located (1888). Later it was also a pharmacy and then – a private German school from 1897 until 1908. From 1933, a primary school was housed in this building, but since 1950 – Saulkrasti Secondary School. In the course of time, the ancient building has partly changed its historic appearance – the second floor is built in the central part, though, in a similar stylistics. Near the main entrance, there was a porch in former times, which is now lost. The architectural solution of the central part of the building has lost its character, because the steep pitched roof with the traditional roof construction is lost. This building is referred to the so-called "Brick style".

At Ainažu ielā 38, the former cottage of baron Kampenhauzen has survived (the first half of the 19th century). It is a very unusual log house with cross corners, at the main entrance - a wide porch with a loggia on the second floor. Time-specific silhouette carvings in the railing of the loggia, at the bottom of the ledge and elsewhere are used.

The boarding house *Strand* at Ainažu ielā 17 is something like an ancient resort icon, built in the time of establishing the Neibāde resort, where an ambulance was housed in the Soviet times, which the author of this article, the holydaymaker at Saulkrasti at the beginning of the 1960s, visited more than once. Certainly, the ambulance is no longer here, for a long time the building has not been used, but now it is reborn. A vast two-storey

Fig. 18. The doctorate of Pēterupe, later a school
[Source: Letonika.lv, 1920s]

Fig. 21. The railway station in Saulkrasti
[Source: photo by author, 2012]

Fig. 19. R. Kaudzīte and K. Krauklis - Damroze in Pēterupe
[Source: Atpūta, 1930s, photo 1913]

Fig. 20. Ainažu iela 38, the former summer cottage
of baron Kampenhauzen, one of the oldest resort buildings
[Source: photo by author, 2012]

loggia has survived in the central part of the two-storey building, where the guests of the boarding house could enjoy the summer evening moods nearby the sea.

At the beginning of the 20th century, Reinis Kaudzīte purchased a property in Pēterupe and together with Karlīne Krauklis-Damroze spent the last years of their life there. This house has survived and it is located at Skolas ielā 17. The writer spent the summers from 1913 until 1920 there. Now it houses the local history museum of Saulkrasti.

The water tower near the railway station of Saulkrasti gives evidence of the construction activities of the 1930s [10]. The five-storey tower floor is of brick masonry, exposed in the facade. The towerjhas a tent-like roofing, at the bottom the roof ledge is adorned with arcatures. This period is also characterized by stations. In Saulkrasti, they are two – Saulkrasti and Pabaži. The major of them is the Saulkrasti station – a one-storey building with the waiting room of a recessed volume. The building has more or less maintained its original shape. The other station – in Pabaži is inexpertly changed by cutting off the lower part of the supports of the covered area, just for opening a shop here.

Katrīnbāde also has its own history. On the beach belonging to the Pabaži manor, the construction of summer cottages began at the end of the 19th century, however, the origin of the site dates back to older times. The name Katrīnbāde is related to the Russian Empress Catherine II and her journey from St. Petersburg to Riga in 1764, on the way having a swim at the Pabaži seaside, as this place was called. In the vicinity of the river Inčupe, near the White Dune linden trees are still growing, planted to mark the occasion. The White Dune

Fig. 22. The White Dune – the estuary of the river Inčupe, where it flows into the sea,
the most favorite place for tourists to visit in Katrīnbāde [Source: photo by author, 2010]

is a visited place by lots of tourists and vacationers, the picuresqueness of which is ceated by the estuary of the river Inčupe, where it flows into the sea. Only a handful of historic buildings have survived in Katrīnbāde. Most of the fishermen's houses are transformed over time - lined with silicate bricks, part of the farm buildings - log houses are destroyed. One of the most interesting sites in Katrīnbāde is the summer cottage of the traders Pfabs at Rīgas iela. Their property was a house in Riga, Kr. Barons ielā 12 (1876, arch. H. Ende and V. Beckmann), but the extensive family spent the summer months exactly in Katrīnbāde. Unfortunately, the residential building has not survived until our days. Only the servants' house,

also called - the stable, and a peculiar well have survived, which are included in the list of the cultural heritage. Above the well, there was an arch, from which by a special winch the water was bailed out with a bucket.

Conclusions

Each location has its own significance in the history of Latvia, providing information about old buildings, monuments, outstanding personalities who have worked for the district. Saulkrasti is also one of these sites. Do we know anything of the first chapel built here, the destiny of the parsonage, etc.? It must be concluded that the results of the research of this site will be interesting for everyone.

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INFORMATION ABOUT THE AUTHOR:
In 1979 **Jānis Zilgalvis** graduated from the Faculty of Architecture of the Riga Technical University. In 1990, he defended his doctoral thesis on the subject of the manor architecture of the second half of the 19th century – the start of the 20th century. Since 1995, he is the Head of the Architecture Department of the State Inspection for Cultural Monument Protection and since 2001 – an associate professor of the Faculty of Architecture and Urban Planning at the Riga Technical University. Since 2012 – a full member of the Latvian Academy of Sciences. Over 170 scientific and popular scientific publications and 17 books (some co-authored). The main lines of reserch – the manor architecture and cultural history, sacral architecture, cultural heritage protection.

Kopsavilkums. Pēterupes draudzes pirmsākumi meklējami jau 13. gs. 30., 40. gados, kad upe saukta par Tarvi un draudze par Tarves draudzi. Konkrētākas ziņas par draudzi saglabājušās no 17. gs. vidus, kad 1641. gadā celta jauna koka kapela, nosaukta Sv. Pētera vārdā. Domājams, ka no tā cēlies arī vietas nosaukums. Šo dievnamu 1692. gadā uzmērījis O. Bergmans. Ilgu laiku Pēterupe bija dažādu draudžu filiāle. No 1710. gada bez mācītāja palikušo dievnamu 1718. gadā sāka apkopt Krimuldas mācītājs prāvests J. H. Hilde 1735. gadā iesvētīta jauna, arī koka baznīca. Tās attēlus savā zīmējumu krājumā ievietojis J. K.. Broce. Vecā koka baznīca laika gaitā bija nonākusi sliktā tehniskā stāvoklī, tāpēc tās vietā iecerēta jauna dievnama būvniecībā. Jauno dievnamu, kā vēsta draudzes telpas sienā iemūrētā piemiņas plāksne cēlis Bīriņu muižas īpašnieks .A. fon Pistolkors 1856. gadā. Patiesībā šajā gadā pabeigta baznīcas torņa būve, bet draudzes telpa uzcelta 1864. gadā un šajā pašā gadā dievnams iesvētīts, tajā atradās 250 sēdvietas.

Viens no baznīcas iekārtas vērtīgākajiem priekšmetiem ir kancele. Kā piemiņa no vecās Pēterupes baznīcas saglabāts ir kanceles uzejas durvju pildiņš, kurā attēlots Sv. Pēteris. Kanceles jumtiņa griestos, tumši brūnos toņos gleznots Sv. Gara simbols – balodis. Dievnama altāra retablu rotā altārglezna *Golgāta,* tās autors ir J. Millers kurš savu darbu veicis 1856. gadā izmantojot par iedvesmas avotu Minhenes Sv. Ludviga baznīcas altārgleznu, kuras autors ir mākslinieks P. fon Korneliuss. Pēterupes mācītājmuiža atrodas krietnu gabalu no baznīcas. 1930. gadu fotoattēlo redzams, ka pie galvenās ieejas piebūvēta plaša divstāvu lodžija. Tās margās redzami siluetgriezumi, logiem ir sešrūšu dalījums. Mācītājmāja stāv savā vietā vēl šodien. Diemžēl, apšūta ar plastmasas apdares dēļiem un arī jumtu sedz neiederīgais *Rannila* skārda iesegums. Neibādi – vienu no ievērojamākajām un vecākajām peldvietām Latvijā 1823. gadā dibinājis Lēdurgas muižas īpašnieks K. fon Reiterns. Viņa piemiņai šī notikuma sakarā vāzi uz augsta postamenta 1877. gadā novietojis Bīrņu muižas īpašnieks A. fon Pistolkors.

A. Kalniņa iela 10 redzama Bīriņu muižas īpašnieka fon Pistolkorsa māja *Forstei*. Iespējams, viena no pirmajām vasarnīcām Neibādē, saukta arī par Mežmuižu, jo mājā dzīvojis mežsargs. 1937. gadā vasaru šeit pavadījis komponists Alfrēds Kalniņš. Ēka ir vietējās nozīmes arhitektūras pieminekls. Savukārt Raiņa ielā 6 atrodas Pēterupes doktorāts (1888). Tajā vēlāk atradās arī aptieka un vēl pēc tam – privāta vācu skola no 1897. gada līdz 1908. gadam. Šajā ēkā no 1933. gada iekārtota pamatskola, bet kopš 1950. gada – Saulkrastu vidusskola. Senā ēka laika gaitā ir daļēji mainījusi savu vēsturisko izskatu – centrālā daļa uzbūvēts otrais stāvs, tiesa gan, ka līdzīgā stilistikā. Pie galvenās ieejas kādreiz atradās lievenis, kas tagad ir zudis. Ēkas centrālās daļas arhitektoniskais risinājums ir zaudējis savu raksturu, jo nav vairs stāvais divslīpju jumts ar tradicionālajām jumta izbūvēm. Šī ēka attiecināma t. s. ķieģeļu stilam. 20. gs. sākumā.Pēterupē īpašumu ieguva Reinis Kaudzīte un tajā kopā ar Karlīni Krauklis – Damrozi pavadīja savus mūža pēdējos gadus..

Par 1930. gadu celtniecības aktivitātēm liecina ūdenstornis netālu no Saulkrastu dzelzceļa stacijas. Piecstāvu torņa stāvs mūrēts no ķieģeļiem, kas eksponēti fasādē. Tornis segts ar teltsveida jumtu, jumta dzega lejasdaļa rotāta ar arkatūru. Minētā laika posmu raksturo arī stacijas. Saulkrastos tās ir divas – Saulkrastu un Pabažu. Vērienīgās no tām ir Saulkrastu stacija – vienstāva ēka ar apjomā iedziļinātu uzgaidāmo telpu. Ēka daudzmaz saglabājusi savu sākotnējo veidolu. Otra stacija – Pabažos ir nemākulīgi pārveidota nokaļot nojumes balstu apakšējo daļu, tāpat ierīkojot tajā veikalu.

Sava vēsture ir arī Katrīnbādei. Šajā Pabažu muižai piederošā pludmalē vasarnīcu celtniecība sākās 19. gs. beigās, taču vietas izcelsme ir daudz senāka. Katrīnbādes nosaukums saistīts ar Krievijas ķeizarienes Katrīnas II braucienu no Pēterburgas uz Rīgu 1764. gadā, pa ceļam izpeldoties Pabažu, kā šo vietu sauca, jūrmalā. Inčupes krastu tuvumā pie Baltās kāpas vēl tagad aug liepas, kas stādītas par godu šim notikumam. Baltā kāpa ir daudzu tūristu un atpūtnieku apmeklēta vieta, kuras gleznieciskumu rada Inčupes ieteka jūrā. Katrīnbādē saglabājušā tikai nedaudzas vēsturiskas ēkas. Lielākā daļa no tām, zvejnieku mājām ir laika gaitā pārveidotas – apšūtas ar silikātķieģeļiem, daļa saimniecības ēkas – guļbūves gājušas bojā. Viena no interesantākām vietām Katrīnbādē jāmin tirgotāju Pfābu vasarnīca Rīgas ielā. Viņu īpašums bija nams Rīgā, Kr. Barona ielā 12 (1876., arh. H. Ende un V. Bekmanis) Taču vasaras mēnešus plašā ģimene pavadīja tieši Katrīnbādē. Diemžēl dzīvojamā ēka līdz mūsu dienām nav saglabājusies. Palikusi vien kalpu māja, kas dēvēta arī par stalli un savdabīgā aka, kura iekļauta valsts aizsargājamo kultūras pieminekļu sarakstā. Virs akas veidota arka, no kuras ar īpašu vinču tika smelts ūdens.

Review of digital tools for landscape architecture

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Abstract. The growing use of more complex visualization techniques and digital tools in landscape architectural practice and research poses a set of challenges for Landscape architects. These include: keeping up to date new developments; acquiring new skills; understanding the strengths and weaknesses of new techniques; and knowing when and how to integrate them into the design and planning process. The purpose of this paper is to take a wide literature study review about: the development of the digital tools in landscape architecture design, profession, and planning in general; how digital tools are being used and practiced by taking different aspects into considerations (e.g. types, stages, techniques, strategies, communication methods, and levels of implementations); digital tool potentials and impact on the landscape design, planning and profession in future. Landscape architects introduced digital tools from architecture, civil engineering, military, aviation and other fields and replaced traditional hand powered tools by digital tools. It seems that now more than ever landscape architects have possibilities to research, plan, design, communicate and present small and large landscapes with the various type of digital tools and visualization techniques and no doubt that they will make huge progress in the near future.

Keywords: digital tools, visual communication.

Introduction

Landscape architects had always relied on the use of various tools and techniques for simulations to explore and communicate design and planning ideas. For a hundred years, pencil, markers, pens, and watercolors have been the main tools to make models, sketches, plans, maps, sections, elevations, and perspective drawings for representation [26; 27]. Today hand powered tools have been replaced by computers [26] and digital tools where the traditional techniques supplement with 3D modeling and animation.

Now landscape architects use analogue and digital media to research and design urban areas and the countryside [20]. Several studies have highlighted the importance of using digital tools in planning to improve understanding of projects in landscape planning and urban planning, and to improve communication among designers, clients, and lay citizens [5; 7; 9; 25].

The growing use of more complex visualization techniques and digital tools in landscape architectural practice and research poses a set of challenges for professionals. These include: keeping up to date new developments; acquiring new skills; understanding the strengths and weaknesses of new techniques; and knowing when and how to integrate them into the design and planning process [27].

The purpose of this paper is to take a wide literature study review about: the development of the digital tools in landscape architecture design, profession, and planning in general; how digital tools are being used and practiced by taking different aspects into considerations (e.g. types, stages, techniques, strategies, communication methods, and levels of implementations); digital tool potentials and impact on the landscape design, planning and profession in future.

Development of the digital tools for landscape architecture

The several thousands of years in landscape architecture pencils, pens, markers, and watercolors were the main tools to make plans, sections, sketches, perspective drawings, and physical models [15; 27]. Since the 1950s, people have worked increasingly with computers. However, it wasn't until the 1960s when the first experiments to introduce digital tools from different fields in landscape architecture started [20].

GIS was the first digital tool used by landscape architects beginning in the 1960s [20], even though GIS was developed in the 1950s. Roger Tomlinson and colleagues developed Canada Geographic Information System (CGIS) for Canadian Land Inventory, as a measuring tool and a producer of tabular information, rather than mapping tool [18]. After that, through the 1960's and 1970's, landscape architects were developing analysis methods that would be incorporated into developing software systems. But in this time government and academic institutions developed hardware and data standards.
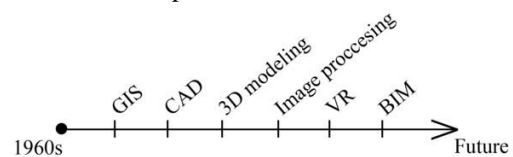

Fig. 1. Timeline of digital tool development in landscape architecture [Source: made by author]

Harvard Researchers created first raster GIS application SYMAP [23] which was used to monitor or analyze natural systems. SYMAP also has been used for mapping viewsheds from particular locations within the landscape. PERSPECTIVE PLOT computer graphic program was the most popular for U.S. Forest Service landscape architects to make perspectives for analyzing landform modifications, siting of structures, timber planning, and road design (Figure 2.) [27]. Ian McHarg set the stage for modern Geographic Information Science in his 1969 book, *Design with Nature* where he outlined the Overlay Method. This method became a standard practice in site suitability analysis and is extremely effective for incorporating natural resource information into planning and design processes. The second great contribution to GIS analysis methods by a landscape architect comes from Carl Steinitz of Harvard University. Steinitz elaborated on the overlay method to produce a model for evaluating landscape change and future impacts of design alternatives [23].

The development of peripheral output devices such as plotters and digitizers together with the ability to store hundreds of maps, symbols, and details for quick recall and presentation, provided the basic foundation that led to the development of Computer Aided Design technology (CAD) [27]. The first steps of CAD industry can be found in 1960, when Ivan Sutherland produced SKETCHPAD and The Electronic Drafting Machine. The use of CAD applications started slowly, because when Digital Graphics division of control Data Corporation launched the first commercial CAD application the price was 500, 000 US dollars and very few units were sold. But some years later when engineers and architects had already used CAD applications also landscape architects were adopting this application [6]. Early CAD packages generated plant symbols at specified locations and scales for planting plans [27].

Computer Aided Design (CAD) and Geographic Information Systems (GIS) software tools have had a significant effect on the visualization of landscape, allowing the creation of 3D landscape models on computers [16]. The earliest effort to place 3D symbols in a landscape image was accomplished in 1969 by Harvard Spatial Analysis Laboratory. Not until 1985 did early pioneers adopt 3D computer tools in landscape architecture [8; 25]

In the 1980s, computer graphics cards and software was emerged which allowed photographs to be captured, stored and manipulated. Elements could be cut from one image and pasted into another one. Unlike the traditional analog photomontage, a digital photomontage can reach a relatively high level of accuracy. This can be achieved by superimposing three-dimensional vector data over
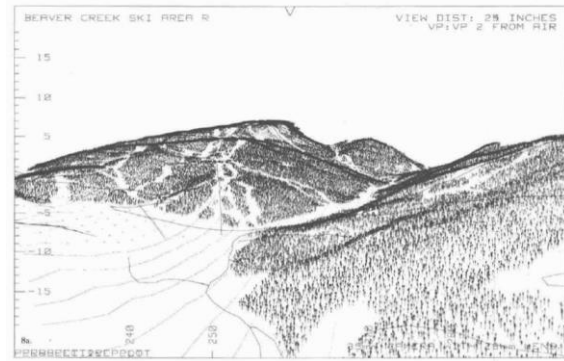

Fig. 2. Cornputer generated perspective graphics in PERSPECTIVE PLOT. Bird's eve view of the Reavcr Creek Ski Area in central Colorado [27]

Fig. 3. An early experiment with CAD and 3D modeling: the design for the 1992 Floride in Zoetermeer, Netherlands is constructed in three dimensions in a digital environment and draped on aerial photograph of existing situation [20]

the two-dimensional image data [15]. Beginnings for the image processing tools can be dated to 1990. Digital photomontages and photo editing comes as a standard tools of landscape architectural education and practice as well as landscape research. They were introduced for the first time in Landscape and Urban Planning to explore Landscape management options in Acadia National Park in response to anticipated landscape change [13].

Transition from the animations and models were first used in flight simulators after the

Second World War, which was the great impact to advancement of virtual reality technology [15]. The birth of VR tool can be traced in the early 1960s, [7] but the full immersion VR environments, initially developed at the Universities of Illinois and Chicago in the early 1990s for astrophysical applications, provide exciting tools for reaching new levels of insight into complex and massive data. Landscape applications of virtual environments (of varied levels of sophistication) have been used to communicate the qualities of a specific plan or design, to provide for interactive manipulation of design elements or to undertake experiments in perception [3]. During the last few decades digital representations of landscape by using VR have

advanced from simplistic, static representations to more or less realistic visualizations, allowing explore landscape space with real time movement experienced at multiple spatial and temporal scales [22]. The latest technologies such as mobile phone augmented reality expands the currently available planning and design toolkit, allowing us to provide people with an augmented view of the real world onsite, where proposed changes can be seen in the context of a fuller ambient array of sensory experiences [13].

One of the newest digital tools in landscape architecture is Building Information Modeling (BIM). This system has been developed for architects and civil engineering, but as of late has come to be in demand for landscape architecture [17]. Now there is no specific BIM software for landscape architects, and this can hinder collaboration with other BIM compliant professionals [1]. However there are few researches about BIM in landscape architecture where they are trying to find the best ways how to made BIM platform for landscape architects. They should not be left out of collaboration with other BIM compliant professionals.

The use of digital tools in landscape architecture

Since the 1960s, the digitalization has been made radical changes in landscape architecture. Landscape architects have been introduced to and adopted many different digital tools from architecture, engineering, military and other fields. Table 1 shows that today landscape architects can use GIS, CAD, Image processing, 3D modeling, VR and BIM tools for different processes, various scales of landscape and to present certain planning scenario for other professionals or public (clients, lay citizens, stakeholders) to improve design process.

Existing GIS tools and methods are more useful for landscape architects in early stage of design to make site analyzes and site plans to capture the results in existing information systems for the future use. GIS tool also offer the needed capabilities for the whole planning cycle. Data capturing for inventory purpose, scientific-based analysis, defining objectives, scenarios and alternative futures and planning measures can be carried out by using GIS to achieve a more sustainable land management. For the implementation and sometimes necessary updates environmental information systems can be developed for specific purpose [21]. GIS tool is a powerful instrument for spatial design at various scales [20]. Results from VR-lab show that as a communication tool GIS is more effective between professionals rather than between professionals and lay citizens [9].

Today, landscape architects mostly works with CAD tools in 2D by making site plans, sections and

elevations and use the 3D only to get information about altitude conditions. Programs like AutoCAD can be used to create 2D visualization techniques and 3D models. To make 3D models can be complicated for user, because there is often an advanced task and the tools which are available to make changes might not be good enough. CAD tools also provide opportunities to make information rich 3d models, many automated processes and an extensive plant library. In recent years the situation has changed somewhat after SketchUp arrived on the market. This software provides free version and is easily for making 3D models with detailed information. In CAD software users can create site plans sorted information in tables about project from 3D models [6]. In Landscape architecture CAD are used for various type of scale more in early rather than final stages of design to present design proposals and location of each landscape element. As a communication tool it is more useful between professionals rather than between professionals and lay citizens [9].

Design of CAD drawings can be improved by using image processing software. Image-editing software refers to a wide range of applications that are used to manipulate pixels for tasks such, editing illustrations, as adjusting photographs and altering image sizes. Vector-editing illustration software refers to the use of points, lines, and shapes in order to represent imagery [26]. Image processing software are often used to design plans, site analyzes, sections and to create photomontages. Table 1 shows that image editing software is not so strong communication tool but more focus on appearance and effects to present creative ideas. Image editing software where is possibilities to draw or sketch are usable in early stages in design process especially for large scale projects. In these software digital photography, Google Earth and preliminary SketchUp models can be used as sketch bases to create perspectives from scratch and provide true context and perspective from which to launch freehand design exploration. The result is accurate design sketches and tremendous time savings [12].

Today, 3D modeling is becoming an essential tool in many profession fields, such as architecture, engineering, geography and also in landscape architecture. In landscape architecture 3D modeling is used to make more or less realistic three dimension landscape models, to get single rendered images, 360^0 panorama and animations. Single rendered images are most common used form of 3D model representation. Animation rather than 360^0 panorama give a more complete picture of the environment by taking a fly-over or walk-through option [15]. Landscape architects use 3D technologies to their projects in order to supplement their traditional 2D methods- plans, maps, sections,

TABLE 1

The use of digital tools in landscape architecture [Source: made by author]

Digital tools	Processess							Design				Communication	
								Scale		Stage			
	Site plans	Site analyzes	Sections	Photomontages	Renderings	Interactive 3D models	Animations	Large	small	early	Final	Proffesionals	Clients
GIS	x	x						++	++	++	+	++	+
CAD	x	x	x					++	++	++	+	++	+
Image procesing	x	x	x	x				++	++	+	++	+	+
3D modelling					x		x	+	++	+	+	++	++
VR						x		+	++	++	++	++	++
BIM	x	x	x		x		x	++	++	++	++	++	+

Legend: + suitable; ++ very suitable.

through all design process. The challenges that encountered landscape architects to use more often 3D visualizations and animations rather than 2D maps, plans and sections are a steep learning curve, and long time-consumption [25]. Although some of newly launched products such as SketchUp Trimble, AutoDesk Infraworks and Lumion3D provide relatively short learning process and allowing more quickly create project proposals [9; 25]. Gaming type software with LOD technique allows make not only small landscape models but also large city 3D models and import objects from CAD, GIS and three-dimensional modeling software. Three-dimensional games software provides interesting and low budget alternatives to landscape architects [10]. But it is still too time consuming and too expensive for large scale average landscape projects. Results from VR-lab show that as a communication tool 3D modeling is effective between professionals and also between professionals and lay citizens [9].

The rapid development of computer hardware and graphic allowed people from 3D models create interactive 3D landscape models by using VR. Interactive 3D models are more visually complex and interactive, that allows people to freely walk around in virtual spaces by taking any eye level viewpoint they wish to observe [16]. Interactive 3D models can be used to describe the location of the project building in relation to other buildings, to present the size and scale of the project and the use of vegetation. *VR i*mproves 3D understanding of the project and also makes a greater motivation for the project, for public [9]. VR, like 3D modeling, are used more for small scale rather than large scale average landscape project because it is still too time

consuming and too expensive. Currently, interactive visualizations of landscape are seen at the end of the design process rather than as a tool for communication between the designer and the stakeholder through all design processes. But there is potential to improve the mental models of each participant through discussion, by collecting together designers, experts and stakeholders in collaborative design workshops [16] and to improve communication between professionals and citizens in design process.

With BIM landscape architects should be able to produce animations, detailed plans, walk-through and renderings for presentation. BIM helps in planning to describe both hard landscape elements such as lighting, surface covering, pools, benches, and walk pathways and soft landscape elements such as different plant types, water usage, by allowing develop and organize detailed information for every landscape detail. By using BIM in best practices can lead to efficient and effective collaborative technology and partnering [1] throughout all design stages more between professionals than professionals and lay citizens [9].

Future of digital tools in landscape architecture

This paper shows that digital technologies are becoming more interactive and increasingly important in daily practice for landscape architects. Digital tools are developing at the very high speed and no doubt that they will make huge progress in the nearest future in landscape architecture.

Further developments of digital tools in landscape visualization may improve understanding and engagement of the design proposals for public

Fig. 4. Presentation in VR-lab at NMBU [24]

Fig. 5. Presentation in VR-lab at NMBU [24]

participation, decision- making and information exchange between professionals and public. Today landscape architects in daily design processes use digital tools to produce much more beautiful pictures (visualizations) at the final stages of design for the selling project. But in future there is potential for using digital tools more as a communication tool with various levels of implementations in early stages of design.

There is also potential for the software developers in landscape architecture to make a new, friendly, easily usable, and special suited landscape digital tools especially 3D modeling and BIM tools for today and future landscape architects.

In the future there is a need for updated educational digital tool programs for landscape architecture with the newest tools. Already now, landscape architecture students after graduation had been evaluated based on their skills to use digital tools when they apply for the job.

However, the tendency of developing more and more representations by digital tools can lead to having more "similar" design projects. By using digital tools landscape architects in the future cannot forget about creativity, individuality and own style how to design landscape and present design proposals.

Conclusions

From the 1950s, development of digital tools transformed the work process in different fields, including landscape architecture. Landscape architects introduced digital tools from architecture, civil engineering, military, aviation and other fields and replaced traditional hand powered tools by digital tools.

The digitalization made radical changes in landscape architecture. It seems that now more than ever landscape architects have possibilities to research, plan, design, communicate and present small and large landscapes with the various type of digital tools and visualization techniques to other landscape architects, designers, experts, stakeholders lay citizens and clients.

Digital tools are developing at high speeds and no doubt that they will make huge progress in the near future. There are possibilities in landscape architecture to develop new software to improve communication between landscape architects and clients and provide better collaboration between professional. But in this digital time landscape architects need to avoid similarity. Landscape architects are creative persons and they need to save their creativity, individuality and own style how to design landscape and present proposals by digital tools.

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Kopsavilkums. Daudzus tūkstošus gadu ainavu arhitektūrā un plānošanā zīmuļi, pildspalvas, flomāsteri un akvareļi bija galvenie instrumenti veidot plānus, griezumus, skices un modeļus. Taču šodien tradicionālie ar roku darbināmie instrumenti tiek aizstāti ar digitālajiem rīkiem. Daudz sarežģītāku vizualizāciju tehniku un digitālo rīku augošais pielietojums ainavu arhitektūras praksē un pētniecībā rada virkni izaicinājumu ainavu arhitektiem. Tie ir šādi: sekot līdzi attīstībai; apgūt jaunas prasmes; izprast stiprās un vājās puses jaunajām vizualizēšanas tehnikām; un zināt, kad un kā integrēt tās projektēšanas un plānošanas procesā. Raksta mērķis ir veikt plašu literatūras apkopojumu par: digitālo instrumentu attīstību ainavu arhitektūra dizainā, plānošanā un profesijā kopumā; kā digitālā instrumenti tiek izmantoti, un praktizēti, ņemot dažādus aspektus (piemēram, veidi, posmi, tehnikas, stratēģijas, komunikācijas metodes un implementācijas līmeņi); digitālo instrumentu potenciāls un ietekme uz ainavu projektēšanas, plānošanas un profesijas nākotnē.

Ainavu arhitekti laika gaitā pielāgojuši digitālos instrumentus, kas aizgūti no tādām jomām kā arhitektūras, militāro, aviācijas un citām. Līdz ar to pētījumā secināts, ka mūsdienās ainavu arhitektiem ir iespējas pētīt, plānot, dizainēt, informēt un iepazīstināt ar dažādiem digitālajiem rīkiem un vizualizācijas tehnikām dažāda mēroga ainavas, prezentēt dažādus attīstības scenārijus klientiem, iedzīvotājiem, kā arī citiem profesionāļiem. Straujā digitālo instrumentu, rīku attīstība tuvākajā nākotnē sniegs vēl lielākas iespējas kvalitatīvai ainavas veidošanā un pētīšanā.