LANDSCAPE ARCHITECTURE AND ART

SCIENTIFIC JOURNAL
OF LATVIA UNIVERSITY
OF LIFE SCIENCES
AND TECHNOLOGIES

VOLUME 17
NUMBER 17

SCIENTIFIC JOURNAL
OF LATVIA UNIVERSITY OF LIFE SCIENCES AND TECHNOLOGIES

LANDSCAPE ARCHITECTURE AND ART

VOLUME 17
NUMBER 17

JELGAVA, 2020

ADDRESS OF THE EDITORIAL BOARD
Faculty of Environment and Civil Engineering, Department of Landscape Architecture and Planning, Latvia University of Life Sciences and Technologies, 22 Riga street, Valdeka palace, Jelgava, Latvia, LV–3004, Phone: + 371 29185575
E–mail: una.ile@llu.lv

Abstracted and indexed*
SCOPUS (indexed since 2016); Web of Science ™, Clarivate Analytics (indexed since 2016); AGRIS; CABI PUBLISHING CAB ABSTRACTS; EBSCO Art Source
(*) – Attention! The data bases select the articles from the proceedings for including them in their data bases after individual qualitative examination. All scientific paper was reviewed by two independent reviewers. Every author is responsible for the quality and the information of his article.

Read our scientific journal in on-line:
http://llufb.llu.lv/Raksti/Landscape_Architecture_Art/
https://llufb.llu.lv/lv/llu-e-izdevumi/llu-izdotie-krajumi-un-zurnali-tiessaiste
http://www.le-notre.org/public_lni/news_show_details.php?news_id=514
https://scholar.google.lv/scholar?q=%22Landscape+architecture+and+art%22+latvia&btnG=&hl=lv&as_sdt=0%2C5
http://www.theeuropeanlibrary.org/tel4/record/3000059529403?classification-cerif=T000&count=1000&locale=uk&link-level=DIGITAL_OBJECT&collection-id=a0163

Scientific journal cover photo: from Aija Ziemeļniece private archive

ISSN 2255–8632 print
ISSN 2255–8640 online
DOI: https://doi.org/10.22616/j.landarchart

INTRODUCTION

Our 17th scientific article edition comes out when the civilization is struggling with the pandemic taking thousands of lives every day for over a year. That is why there is an increasing importance of researches related to the external space, green areas and art activities, which are summarized in this volume. An open-air concert hall with a unique structural concept and form on a narrow river island. A community garden – a small mansion courtyard in urban environment, giving a possibility to overcome depression, develop creativity and communication by transforming the courtyard into a garden of herbs and flowers, where the inhabitants can enjoy its harvest. Summarizing the basic information on the external factors and using the methods of the mathematical analysis and comparison, the attention is paid to the factors that have positively influenced the formation of communities in the context of the pandemic, and the benefits of their development in Latvia are clearly stated.

The second part of the research is devoted to the preservation and restoration of heritage, looking for the models of historical urban environment and sustainable development that could be used for city development policies and planning. One of the researches is considering a methodology useful for the restoration of historical parks in accordance with the requirements of the Florence Charter. Rather than an object in terms of its biological versatility, a park is investigated as a constructed monument and the element of architecture with the composition mainly formed by woody plants. The research block related to cultural heritage is also examining the architectonic style of orthodox churches, starting from the historical aspects to our time. The research places an emphasis on the creation of new orthodox churches aimed at the recouping of losses. The attention is paid to the natural base area, constructing the churches in the territories of parks, forest parks, lake shores.

In its turn, the research of the urban parks demonstrates that they are created as a tourism environment with the system of economic and social elements, achieving a balance and integrity among its functions and its users. A national park should be perceived as a public living environment. It should be especially applicable for the current dramatic situation in the world.

PRIEKŠVĀRDS

Mūsu zinātnisko rakstu 17. izdevums tiek laists klajā, kad civilizācija jau vairāk kā gadu cīnās ar pandēmiju, kas ik dienas atņem tūkstošiem dzīvības. Tāpēc aizvien lielāku nozīmi iegūst pētījumi, kas aplūko ārtelpu, zaļās teritorijas un mākslas aktivitātes., kas secīgi arī apkopti šajā sējumā. Brīvdabas koncertzāle ar unikālu konstruktīvo risinājumu un formveidi uz šauras upes salas. Kopienas dārzs ‑ neliels savrupmājas pagalms pilsēttelpā, kas spēj uzveikt depresiju, attīstīt radošumu un komunikāciju, pagalmu pārvēršot garšaugu un ziedu dārzā, kur augļus var baudīt mājas iedzīvotāji. Apkopojot pamatinformāciju par ārējiem faktoriem, kā arī izmantojot matemātiskās analīzes un salīdzināšanas metodes, tiek atzīmēti faktori, kas pandēmijas apstākļos ir pozitīvi ietekmējuši kopienu veidošanos, un skaidri norāda to attīstības priekšrocības Latvijā.

Otra pētījumu daļa pievēršas mantojuma saglabāšanai un atjaunošanai, meklējot vēsturiskās pilsētvides un ilgtspējīgas attīstības modeļus, kurus iespējams izmantot pilsētu attīstības politikas veidošanā un plānošanā. Viens no pētījumiem pieskaras metodikai, kas noderēs vēsturisko muižu parku atjaunošanai, atbilstoši Florences hartas prasībām. Parks netiek pētīts kā objekts no bioloģiskās daudzveidības puses, bet gan kā būvēts piemineklis un arhitektūras elements, kura sastāvu galvenokārt veido kokaugi. Kultūrmantojuma pētījumu bloks aplūko arī pareizticīgo baznīcu arhitektonisko stilistiku no vēsturiskajiem aspektiem līdz mūsdienām. Pētījumā akcentēta jaunu pareizticīgo baznīcu izveide, kas ir vērsta uz zaudējumu atgūšanu. Uzmanība tiek likta uz dabas pamatni, dievnamus izvietojot parku teritorijās, mežaparkos, ezeru krastos.

Savukārt, pētījums par pilsētas parku pierāda, ka tas tiek veidots kā tūrisma vide ar ekonomisku un sociālu elementu sistēmu, tā panākot harmonisku un integrētu līdzsvaru starp funkcijām un lietotājiem. Nacionālais parks ir jāsaprot kā dzīves telpa sabiedrībai. Īpaši tas ir attiecināms uz pašreizējo dramatisko situāciju pasaulē.

Aija Ziemeļniece
Editor in Chief

CONTENTS

DOI: 10.22616/j.landarchart.2020.17.01

Open Spaces and Elements Designed to the Landscape of Hortobágy National Park

Fernando Arturo Mendez Garzón, *Szent István University*

Abstract. The project arises from problems found it in the poor dissemination of information, low identity with the surrounding, limited resistance and deficient quality of materials, impossibility of non-Hungarian speakers to access the information, difficulty of recognition and identification of the places by the visitors and the inexistence of a common morphologic language in the elements and spaces for the network of National Parks including for the Hortobágy case. From the academy, the proposal is planned to be inserted within the project of renewal and enhancement of the network of National Parks of Hungary. The project's methodological framework is composed of a nonlinear axis, which covers different levels of the process; Beginning with related worldwide cases data collection and literature review as well as Hungarian National Parks data, then data analysis and evaluation to identify the landscape character, the establishment of design parameters, experimentation into the study area, design alternatives formulation, assessment, and qualifying, finally design in detail and validation of the results.

The paper seeks to show a unique system of elements and spaces, designed in the framed of the Hungarian National Parks, in this study case, specifically for the Hortobágy National Park located at east Hungary materialized in a group of pre-set areas, outdoor furniture and signalling elements that fit harmoniously into the landscape. Thus, integrating concepts such as landscape character, local identity, sustainability, high technology, and universality result in a proposal of high-quality design for the improvement of the competitiveness and to enhance people´s experience in the Hortobágy NP and the enjoyment of its landscape through the formulation of a viable and comprehensive design proposal.

Key Words: National Parks, Open Space Furniture, Landscape Character, Landscape Experiences

Introduction

Despite the relatively well-developed infrastructure and the great tourist potential of the network of Hungarian National Parks including Hortobágy National Park, nowadays there is a weak system of furniture, signaling, and lighting that does not fulfill the necessary requirements to satisfy a growing, international and diversified tourist activity [3].

A comprehensive and standardized system of these elements is fundamental for the proper enjoyment of the tourist experience within the parks and that is why today, is easy to find as a worldwide trend; the high efforts, and investment in the field of furniture and signaling design, as an indispensable part in the development of landscape design because it directly influences the experience of the tourist and locals within the national parks. These types of elements beyond the function can become symbols, landscape marks and even part of the identity of a place, hence the great importance of an accurate proposal and based on the particularities of each site, likewise with the inclusion of concepts such as universality, usability, readability, sustainability, feasibility, etc. that create a sense of identity and belonging in a place [5; 14]. In any case, the absence or weak presence of these elements has been gradually promoting the development of anomic socialization forms in which is easy to find a de-structuring of the identity and collective representations, segregation, and social hierarchy of the population, deficit of information and difficulty of access to local cultures and permanent obsolescence of traditions [7].

The interactions of tourists and locals (users) with each other and with the artificial elements placed in those spaces and the type of meanings of this process and the type of landscape marks (such as furnishing, equipment, norms, signs, their spatial disposition, their prioritization over time, their contextual relevance, their ability to produce collective identity, their quality, etc) become fundamental factors in the regulation of citizen behavior and defines its experience [14] (Fig. 1). This shows that the rhythm of construction of the equipment, its location, functional and identity characteristics and the operation and maintenance processes have not responded to the dynamism experienced by the tourist boom and to the green development of the regions [13]. The equipment destined to represent the government is poor and deficient, increasing the lack of ownership of the national and local entities in the National Parks. Promoting statal presence depends on the correct supply of functional and cultural furnishings and infrastructure [13].

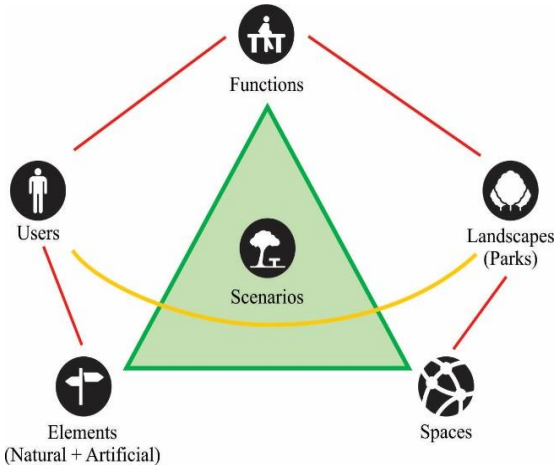


Fig. 1. Interactions [created by the author]

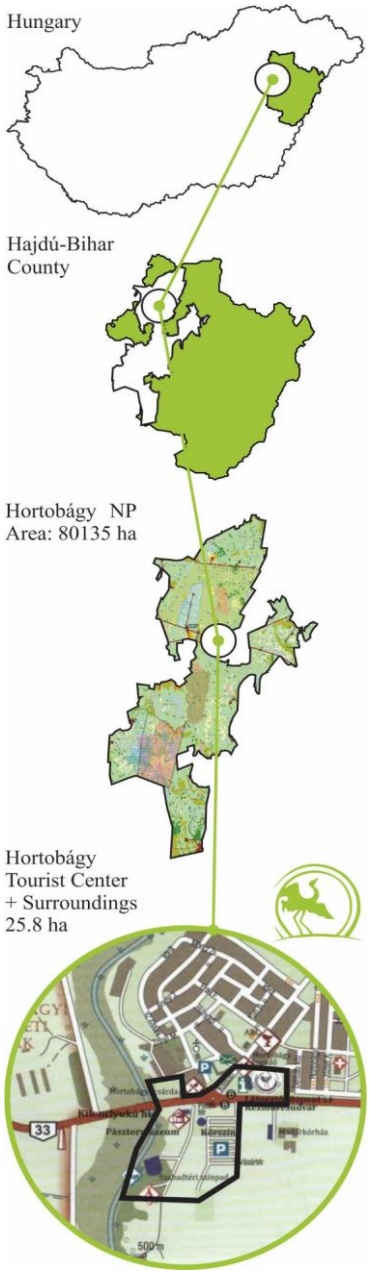


Fig. 2. Hortobágy NP Location [created by the author]

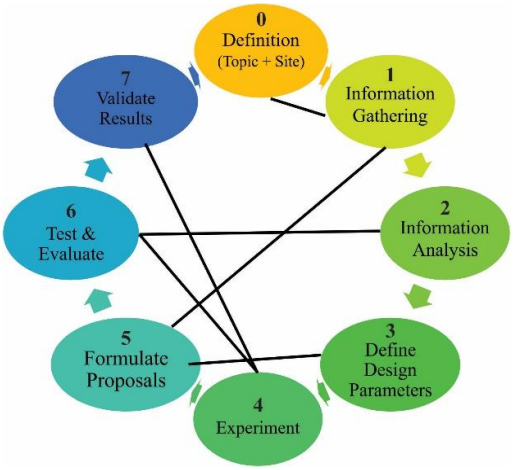


Fig. 3. Methodology [created by the author]

The project seeks to enhance the experience of people in the Hortobágy National Park through formulating a proposal of viable and integral design of open spaces and artificial elements into and for the landscape that allows better interaction with the natural landscape.

Material and Methods

Hortobágy National Park is 800 square kilometers, located in eastern Hungary filled with folklore and cultural history. The park, which forms part of the Great Plain of Hungary, has been listed as a World Heritage Site [6; 8]. It is situated in an area where a unique shepherding culture that has evolved over many centuries, manifesting itself in distinctive traditional styles of clothing and architecture, and the tending of particular types of animals that are not found anywhere else [4]. The Hortobágy region is the largest continuous natural grassland in Europe, and the National Park was established in 1973 as the country's largest protected area. Hortobágy has outstanding natural features, maintaining great biological diversity with respect to species and habitats [12]. It is a unique example of the harmonious coexistence of people and nature based on the careful use of the land [11] (Fig. 2).

The cultural landscape of the Puszta represents the highest scenic quality, with pleasing and dramatic patterns and combinations of landscape features which give it a distinctive character, including aesthetic qualities and topographic and visual unity [1; 10]. The unbroken horizon is only occasionally disrupted by trees, groves, settlements or linear establishments. Human-made elements fit harmoniously into this landscape and sustainable land-use practices have contributed to the conservation of a diversity of species and biotopes and the maintenance of the landscape [15].

TABLE 1

Table of Requirements [created by the author]

Requirement (Must comply)	Description (What)	Determinant (How)
1. Resistance	▪ Use local and natural materials. (Wood-Stone) ▪ Materials who resist the natural conditions.	▪ Use native wood, stone and, concrete. (Oak, Poplar / Beech / Elm / Reed) ▪ Use a roof or a cover.
2. Usability / Readability	▪ Has to be easy to read and understand. ▪ Has to be easy to identify.	▪ Use of universal and international symbols and pictograms for standard agreements. ▪ Use information about distances and times. ▪ Use at least two languages. ▪ Use high contrast for reading.
3. Cost	▪ No more expensive than the current elements.	▪ Straight lines and soft curves. ▪ Few materials and fabric processes. ▪ Not expensive materials. ▪ Simple shapes mean fewer costs.
4. Identity	▪ Take advance of the local identity (Activities, Economy, Materials, Shapes, etc.) ▪ Use current icon elements of each park.	▪ Use local materials. ▪ Use logos and branding of the NP network. ▪ Use one unique logo and color for each NP.
5. Maintenance	▪ Design for low maintenance. (Strong Materials) ▪ Easy to clean. (Trash bins)	▪ Not use of trash bags. ▪ Use of cover or roof. ▪ Easy to clean.
6. Aesthetic Value	▪ Has to be visually attractive and universal. ▪ Use the imaginary of people of natural parks.	▪ Simple shapes. ▪ No complexity.

The methodological framework is composed of a nonlinear axis, which covers different levels of the process [2]; Beginning with the data collection and literature review of worldwide cases as well as of the Hungarian national parks, then analysis of collected information and identify the landscape character, establishment of design parameters, experimentation in the place with real materials and resources, formulate design proposals, then assess and qualify the proposals, and finally design in detail and validate the results (Fig. 3).

The data collection consisted of grouping and gathering information from different sources (digital media, brochures, publications, papers and physical visits to the national parks). At this level, the collected information was analyzed and the relevance of this was verified. In addition, within this analysis, the existing site (Hortobágy NP) was studied (Landscape character, symbology, geography, topography, flora, local materials, structure, functions, hierarchy, etc) in addition studying the existing typologies of furniture using the following criteria; aesthetic value, maintenance costs, ease of use, the resistance of their materials and identity. These serve as an objective frame of reference for the correct evaluation of the elements giving them a grade from 1 (None compliance) to 5 (Total compliance). The analysis of case studies abroad (Yosemite-United States, Monte Perdido-Spain, Tayrona-Colombia, and Phi Phi-Thailand) was made using the same criteria and assessment. The design parameters of both the objects and the space between those that stood out were proposed; production processes, evaluation methods, levels of resistance and security, levels of adaptability and identity with the site.

At this level, design alternatives were proposed through various methods such as; brainstorming, establishing design concepts and methodologies or adapting existing ones, it was primordial the use of native flora, local materials and common morphology as design requirements. The verification of proposals was made through fulfilling requirements (must comply); Resistance, usability, costs, identity, maintenance, and aesthetic value. Table 1 shows how the requirement can be accomplished. The validation of the results, comparing and weighing them: at this level all the checks are validated by comparing them with each other and with other successful cases abroad, measuring the degree of user satisfaction, finally, all the steps are fed back to make the integral evaluation of the project.

Results and Discussion

The development of the project includes three intervention scales in the space, each with different complexities. The largest scale of intervention is the conceptual design of the entrance area to the Hortobágy National Park (approximately 25.8 Ha), in which all the scenarios would be located and serve as the implementation framework for the scenarios, This conceptual design contemplates the redistribution of spaces and functions. The second intervention scale is medium-sized, this would be the design of the five scenarios in detail, each with different functions, configurations and elements and finally the small-scale intervention that is defined by the design in detail of all the elements that would be available within the different scenarios (16 different types of elements).

The spatial analysis of hierarchy and uses showed that there are five patterns/kinds of open spaces prone to be intervened and where the elements can be placed in order of functions and users that can be found in the network of Hungary National Parks. These implementation spaces are the fundamental axes of the project, they have particular characteristics of; uses, users, functions, elements and vegetation (Fig. 4). Into the master plan can be differentiated five kinds of scenarios; the first open space typology is the "Visitor Center Scenario" that consists of the area in front of the Tourist Center, covering an area of 60 m2, designed to fulfill the requirements of all type of users. The main functions are to provide a space to sit and wait, give information about the park, provide bike parking and enhance the aesthetic of the visitor's center outer garden using nine types of elements. The vegetation proposed to this scenario includes native flora as *Calystegia sepium* (Hedge Bindweed), *Leucojum aestivum* and *Fraxinus angustifolia* (Fig. 5).

The second typology is the "Park Gate Scenario" that consists of the open space design of the vehicle access area where is located the round point in 33 National Road. It covers an area of 10 m2, the main purpose is to indicate the visitors the main entrance of the park and shows a morphological connection with the surrounding, using local materials and analogical shapes referenced to the local architecture. The vegetation proposed is *Pulsatilla pratensis* (Pasqueflower), *Iris humilis* (Sand Iris) (Fig. 6).

The "Entrance Scenario" is the open space located in the park´s entry, just beside the parking lot. Encompass an area of 60 m2, projected to provide functions to all types of users. The main functions are to provide a space to sit and wait, giving information about the park, locate the tourists into the park and their main touristic spots, using nine types of elements. The flora proposed is *Calystegia sepium* (Hedge Bindweed), *Leucojum aestivum* and *Fraxinus angustifolia* (Ash) (Fig. 7).

For the main touristic spots, I proposed the "Contemplation Scenario" that consists of an open space designed to enhance the enjoyment of the landscape in the hotspots as the river shore and the dock, covering an area of 30 m2. The uses are to provide a space to sit and enjoy the view, give information about the place, and mainly enhance the landscape contemplation. The vegetation proposed to this scenario includes native flora as *Typha angustifolia* (Lesser bulrush), *Phragmites australis* (Reed) (Fig. 8).

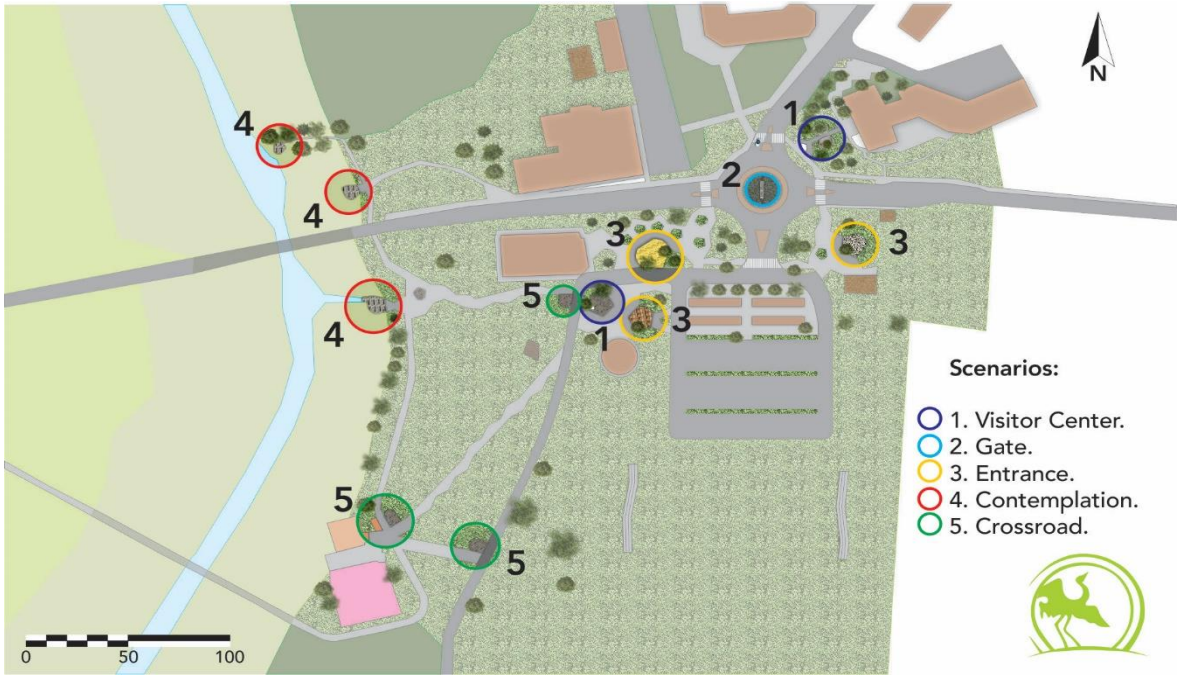


Fig. 4. Master Plan. Scenarios location [created by the author]

Fig. 5. Visitor center scenario [created by the author]

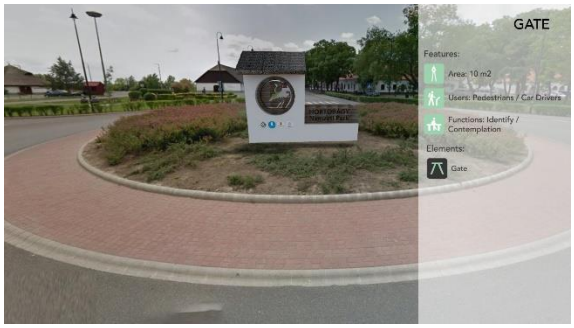


Fig. 6. Park gate scenario [created by the author]

Fig. 7. Entrance scenario [created by the author]

Fig. 8. Contemplation scenario [created by the author]

Fig. 9. Crossroad scenario [created by the author]

Finally, the last typology is the "Crossroad Scenario" projected to the areas where two or more paths crossed. It covers an area of 60 m^2, designed to provide a space to sit and rest, giving information about the site and locate spatially the user, using four types of elements (Fig. 9). The proposal was designed based on the landscape character of the National Park, using a table of parameters and requirements to fulfill including, morphology, topography, flora, local materials, production, usability, and environmental conditions.

Conclusions

The project evidenced that the natural landscape in the National Parks is almost already defined and that means that rural areas need a different approach than urban areas, this different approach makes that there is not necessarily a strong physical modification of the landscape to preserve the natural landscape of the parks as much as possible and enhance the perception of the landscape through the open space design in key sites integrating four main concepts; Identity + Elements + Spaces + Functions = Open Space Design.

In the case of Hortobagy NP, the project showed that is possible to optimize and transform the perception of the landscape through a unique morphological concept, creating a unified and standardized identity between the park and the elements, likewise enhances the identity of each area with the design of elements with specific and unique features for the site. Finally, it takes advantage economically the tourism potential of the National Parks generating an economically, socially and environmentally sustainable system of elements achieving a harmonious and integrated balance between site, functions, and users. Accordingly, the public space in the National Park must be understood as a potentiality of life in a community that allows the appropriation and collective consumption of the spaces. It works as a support for economic, social and cultural activities and permits mobilization and social interactions. The project showed that in the case of public space in National Parks, the quality, and quantity of furniture and equipment define and determine the citizen interactions, the enjoyment of the touristic experience, the level of identification and the forms of appropriation that are established with the landscape and the environment. This means defining and establishing geographical, rural, architectural, functional, historical, and symbolic elements that allow building an image of public, accessible and enjoyable National Parks, capable of becoming the object of people´s perceptions, the imagery of the landscape and source of a country identity.

References

1. **Buka, L., Gyarmathy, I., Papp, L**. *Nemzetipark-Igazgatóság. Magyar Nemzeti Parkok. Hajdúság, Landscape Protection Area*. ISSN 1586-4243.
2. **Bürdek, B.E.** *Design; History, Theory, and Practice of Industrial Design*. Barcelona: Gustavo Gili SA, 2002, p. 155-167.
3. Hungarian Tourism Agency. *Visit Hungary*. [online 26.08.2012.]. http://visit-hungary.com/things-to-do/national-parks
4. Hungary Guide. *National Parks Hungary – Pure Nature*. [online 04.07.2009.]. http://national-park.hungaryguide.info/
5. **Inada, J., I.** *Between Landscapes and Gardens. A Collection of Jun-Ichi Inada´s Landscape Architecture Work´s*. Singapore, 2008
6. **Junaite, M.** *Culture Trip – The Most Beautiful National Parks in Hungary*. [online 06.06.2017.]. https://theculturetrip.com/europe/hungary/articles/the-most-beautiful-national-parks-in-hungarythe-most-beautiful-national-parks-in-hungary/
7. **Miller, J., A.** *Signs & Spaces*. California, Rockport Allworth Editions, 1994, p. 26-38.
8. **Nemes, V.** *Water and Fire Project*. [online 23.03.2015.]. https://waterfire.fas.is/Hungary/NationalParksofHungary.php
9. Nemzetipark-Igazgatóság. Ministry of Rural Development. *Magyar Nemzeti Parkok. Heritage Interpretation Sites*. Budapest, 2014, p. 13–16.
10. Nemzetipark-Igazgatóság. Ministry of Rural Development. *Magyar Nemzeti Parkok. Experience? Naturally!* Budapest, 2014, p. 8–15.
11. Nemzetipark-Igazgatóság. *Magyar Nemzeti Parkok.* [online 17.08.2017.]. http://magyarnemzetiparkok.hu/hortobagyi-nemzeti-park/
12. Nemzetipark-Igazgatóság. *Areas of operation of national park directorates*. [online 05.07.2017.]. http://magyarnemzetiparkok.hu/a-np-igazgatosagok-mukodesi-terulete/
13. **Rosling, H., Gapminder.** Information Design and Human Development. [online 11.21.2006.]. http://terremoto.net
14. **Salcedo, J., P.** Theoretical Designer Specialist in Creativity, 2008.
15. Unesco. *World Heritage List – Hortobágy National Park – the Puszta*. [online 11.02.2018.]. https://whc.unesco.org/en/list/474

AUTHOR:
Fernando Arturo Mendez Garzón; Industrial Designer graduated from the National University of Colombia and Buenos Aires University (Argentina). Master in Garden and Landscape Architectural Design at Szent Istvan University (Budapest-Hungary). Currently a student of the Ph.D. program at the Doctoral School of Landscape Architecture and Landscape Ecology at Szent Istvan University in the Department of Landscape Protection and Reclamation, In the last years focused on the research of development and restoration of National Parks in Colombia and Hungary, developing the Doctoral Research; "Consequences of the Colombian armed conflict in the landscape of the National Parks; Sumapaz NNP, Paramillo NNP and, Farallones de Cali NNP Case Study." E–mail: famendezg@yahoo.com.mx

Kopsavilkums. Nacionālā parka *Hortobágy* projekts pierādīja, ka ainavas uztveri ir iespējams optimizēt un pārveidot, izmantojot unikālu morfoloģisko kocenpciju, izveidojot vienotu un standartizētu identiāti starp parku un elementiem. Vienlīdz uzlabojot katras teritorijas vietas identitāti, elementu dizainu ar specifiskām un unikālām vietas īpašībām. Rezultātā iegūta ekonomiski izdevīga un pamatota parka attīstības vīzija, veidojot parku par tūrisma vidi, radot ekonomisku, sociālu un videi ilgtspējīgu elementu sistēmu, panākot harmonisku un integrētu līdzsvaru starp vietni, funkcijām un lietotājiem. Nacionālā parka publiskā ārtelpa ir jāsaprot kā dzīves vide sabiedrībai, kas ļauj piesavināties un kolektīvi izmantot parka teritoriju. Projekta risinājumi parādīja, ka publiskā ārtelpa nosaka iedzīvotāju mijiedarbību, tūrisma pieredzes baudīšanu, identifikācijas līmeni un apropriācijas formas, kas tiek noteiktas līdzvērtīgos parkos.

DOI: 10.22616/j.landarchart.2020.17.02

Role of Natural Landscape in Perception of Ukrainian Sacral Architecture Monuments

Denys Chernyshev[1], Yulia Ivashko[1], Dominika Kuśnierz-Krupa[2], Andrii Dmytrenko[3]
[1]Kyiv National University of Construction and Architecture, [2]Faculty of Architecture, Cracow University of Technology, [3]National University "Yuri Kondratyuk Poltava Polytechnic"

Abstract. The article analyses the impact of natural environment on the creation of a Christian church design, as an example, reviews the Orthodox architecture of Ukraine – historical and contemporary one. From time immemorial, Orthodox churches were erected in the most picturesque places – on high hills, steep banks, near rivers and lakes – so that the temple was reflected in the water surface. A typical example is the historical silhouette of the steep right bank of Kyiv, formed by many churches, cathedrals and monasteries located along the edge of the hilly shore. If temples in the urban environment were constrained by the conditions of dense quarterly development (the principal cathedrals and monasteries were an exception), then the peculiarity of the remote suburban monasteries – the hermitages – was precisely the creation of nature and architecture picturesque combination. At the monasteries, parks, gardens and flower beds were created, artificial lakes were arranged. During the domination of the atheistic ideology, temple construction was in decline, most of the cathedrals, churches and monasteries were destroyed or redesigned under the socialist functions of clubs, museums of atheism, schools and storages. The contemporary course in the creation of new Orthodox churches is aimed at restoring the lost sequence in the church building. In this case, particular attention is paid to the natural environment: churches are built in park areas, in forest parks, on the banks of lakes, surrounded by flower beds. The relevance of the study is explained by the presence in Ukraine of a large number of Orthodox churches – both architectural monuments and newly built, which are traditionally surrounded by gardens, parks and flower gardens as symbols of their non-earthly purpose, the image of the Garden of Eden. Therefore, during the restoration and new construction of such objects, it is necessary to understand the features of the church landscape design, which has been formed and improved over the centuries.

Keywords: Churches of Ukraine, natural landscape, figurative perception

Introduction

The landscape of Ukraine has long been amazingly picturesque, steep and gentle banks, mountains and valleys alternated here, and in past centuries a vast territory of the country was covered with forests. Such a picturesque landscape has historically contributed to the construction of a large number of temples and monasteries in a natural setting. Over the centuries, a unique synthesis of nature and man-made objects has been formed – a steep terrain, water, green areas have repeatedly enhanced the aesthetic expressiveness of architecture, and architecture has become the main chord and accent of the landscape picture. The first Christian churches here were built before the official baptism of Kyivan Rus by Prince Volodymyr the Great in 988. Most likely, the traditions of building churches on the most picturesque places of the relief are associated not only with their safety, urban development feasibility and artistic-figurative perception but also with deep, not eradicated Christianity pagan beliefs associated with the deification of natural phenomena, water and trees [1; 2; 14]. It is no coincidence that many temples were built on places where pagan temples were previously placed.

Fig. 1. St. Paraskeva's church in Zarubyntsi. Watercolour by Yulia Ivashko

It can be argued that for the population of those territories, a significant factor was the relationship with the natural environment, which is especially noticeable in the example of the rural Orthodox architecture. For the building of the church, most often wooden, the most appropriate place was chosen, it was visible from afar; if a lake or river was nearby, then the church was built near them (Fig. 1) [2; 6; 9; 10; 11; 16].

If the village was large and rich, each of its parts could have own church. For the church, they tried to choose the highest quality wood – oak or pine.

At the same time, the natural environment seemed to demand the main image of the church – for example, on the Left Bank of the Dnipro (Slobozhanshchyna, Poltavshchyna) very tall tower churches were built on the plain, visible from afar and seemed even higher due to the effect of a slight inclination of the outer walls to the central axis and vertical wall siding with boards; in the Carpathians, among the mountains, there was no point in building such high temples, so the churches there are lower and consist of many low tiers, reminiscent of the European Spruces and *smerekas* (Picea pungens) surrounding them, and the walls and domes are shared with thin plates – wood shingles.

Results and Discussions

The theme of Ukrainian Baroque in Ukraine has always attracted domestic scholars, as this period is also called the Second Ukrainian Renaissance and was characterized by the maximum expression of national and regional features in architecture, art and landscape design.

Since the main objects of the Baroque period are monastic ensembles of a high aesthetic level, it is quite reasonable that the best examples of gardens were introduced in the monasteries of this period.

Landscape descriptions made it possible to present the natural surroundings of the church. For example, Hrygorii Pavlutskyi wrote about the cathedral church of St. George in Tarashcha, that the temple is very tall and large in size, stands on a mountain, towering over the whole city [9].

A particular aspect of the study is the rural monasteries. Attention to the picturesque natural environment begins to show itself starting from the period that has been called "Ukrainian Baroque" in many Ukrainian scientific sources, as noted by such researchers as Viktor Vecherskyi [12; 13], Serhii Kilesso [4], Hrygorii Logvyn, Tetiana Kilesso, Mykola Orlenko [7; 8], Leonid Pribeha, Olha Sitkareva and many others.

However, the term "Ukrainian Baroque" itself causes a lot of complaints, since it cannot be considered a direct analogue of Western European Catholic Baroque.

Some researchers (H. Logvyn [5], V. Vecherskyi [12; 13]) questioned this term and emphasized the direct connection between the image of stone churches of the Hetmanate period and wooden churches, the origins of the architecture of which were purely folk, formed under the impact of local climatic conditions and traditions.

Matherials and Methods

Given the controversy and versatility of the study, the authors used such scientific methods as the method of literature analysis for the analysis of literary sources, religious documents and mentions of baroque gardens in the fiction of those times, the method of historical analysis to study the origins of Orthodox construction in Ukraine and comparative analysis to identify the features of the interaction of nature and the church and to identify the features of temple landscape design at different historical periods.

The choice of research methods was determined by the selected geographical and chronological boundaries of the study. Examples of gardens at the most famous urban and suburban monasteries of the Baroque period were analyzed.

The main goal was to determine the common and different between the monasteries landscaping techniques in different regions of Hetman Ukraine, the importance of landscape for the perception of architectural objects of Hetman Ukraine and common approaches to designing monastic ensembles and gardens at monasteries.

Despite the large number of scientific publications devoted to the Baroque in the lands of the Hetmanate, the issues of the Baroque period monastic gardens systematization, identification of common and different between them, as well as determination of regional features of monastic landscape design remain unexplored. This became one of the tasks of the presented study.

There was also a common approach to the monastic landscaping of the Baroque period in other nations. This is a scientific novelty of the study.

The study covers geographically – the territory of central and left-bank Ukraine, chronologically –the period of the second half of the 17^{th}–18^{th} centuries, called the period of the Cossack rule – Hetmanate, when national traditions were maximally expressed both in architecture and in landscape design.

Among the most outstanding objects in the natural environment, the churches of the Kyiv-Pechersk Lavra Monastery in Kyiv, the Holy Trinity Ioninskyi Monastery, the Vydubychi Monastery, the Kytaievo Monastery in Kyiv, the Trinity and Yeletskyi Monastery in Chernihiv, the Mhar Monastery in Poltava region were analyzed in detail.

Main part

The church architecture of the Hetmanate period and its touch with natural environment

The unique character of the Ukrainian Orthodox architecture was in a mixture of architectural and constructional and landscape traditions brought in from the border, combined with local customs.

This process was activated due to the invitation of European architects brought up on the traditions of European Catholic Baroque (for example, Johann Baptist Sauer during the construction of the Holy Trinity Cathedral of the Holy Trinity Monastery in Chernihiv and the Saviour-Transfiguration Mhar Monastery; or Johann Gottfried Schaedel during the construction of the Great Lavra Bell Tower and the Zaborovskyi Gate) and sometimes Moscow architects (for example, Dmitrii Aksamitov during the construction of the St. George Cathedral of Vydubychi Monastery).

The peculiarity of the Baroque period temple construction on the areas of the Hetmanate region, which were under Cossack rule, is exceptional attention to the location of the church, a tradition that dates back to pre-Christian times when religious pagan buildings were built on the most beautiful places, on the banks of rivers and lakes.

It was during the Hetmanate period that a specific type of monastery appeared that continued to develop in the following centuries – in the structure of urban buildings or the countryside, occupying a somewhat remote position, surrounded by lavish greenery, with a developed system of gardens and flower beds, on the banks of a natural or artificial pond.

That is how the Upper and Lower Lavra [8], the Holy Trinity Ioninskyi Monastery, the Vydubychi and Kytaievo Monastery in Kyiv, the Holy Trinity and Yeletskyi Monasteries in Chernihiv, the Mhar Monastery and several others are placed often in the system of natural hills, a developed scheme of the underground monastery with temples and cells was gradually created.

The natural factor was often essential in the original development of the monastery: as an example, the caves of the Upper and Lower Lavra in Kyiv, the Anthony Caves in Chernihiv, that is, the first cave settlements could be in the depth of the hills starting from pre-Christian times or the first years of Christianity in Kyivan Rus [15].

The attractiveness of such places for settlement was justified by several positive reasons, such as the protection factor (upland, underground passage system), the provision of water and food (fish), transport accessibility, the availability of good soil and climate for farming (there were always gardens in the system of monasteries, plots, apiaries, which gave food for the brethren of the monastery and their products were sold).

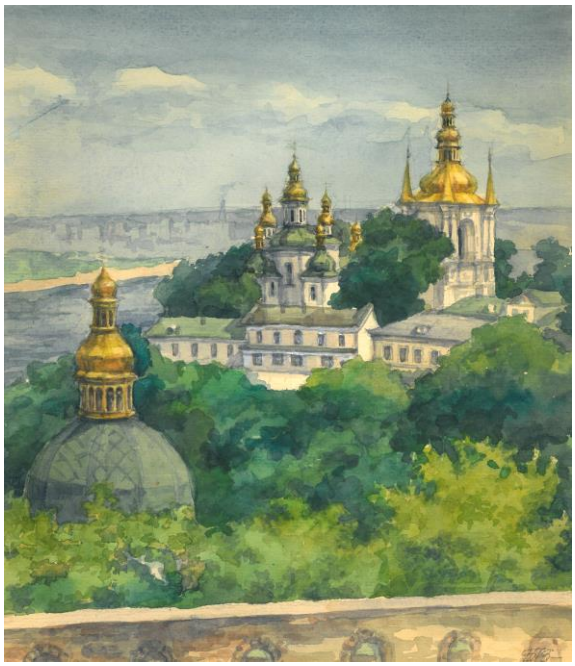


Fig. 2. The territory of Lower Lavra. Watercolour by Yulia Ivashko

Catherine II began to pursue the secularization policy which was aimed at the confiscation of the farming acreage and finances of the monasteries to the state treasury. Up to that time, the monasteries were the richest landowners that ran not only their gardens and vegetable plots for their own needs but also arable lands, hayfields and lakes [12; 13].

The monastic life in the most famous Kyiv-Pechersk Monastery in Kyiv was subordinate to the charter of Saint Theodore of Stoudite; this fact also affected the layout of the monastery territory, which was especially manifested during the Hetmanate period, when the system of the monastery buildings arrangement in the concentric circles appeared. In the centre, in the most prestigious zone, the central cathedral of the Assumption of the Mother of God was built; next to it was the refectory the oldest monastery garden and spring, thereby combining architecture and natural surroundings [8].

Therefore, nature at that time was interpreted as a significant element that complements the principal architectural structures. To the west of the refectory, the buildings of the "Archimandrite Chambers" were placed, and behind them, around the territory of the Upper Lavra, there was the Archimandrite Garden, which was interpreted not only as a recreation but primarily as a sacred symbol of the heaven on earth, the biblical Eden, because plants and trees planted in it expressed the specific dogmatic meaning and symbolized the Christian honesty (Fig. 2). During the Hetmanate era, the monastery gardens in their images corresponded to the detailed architecture, which is known as "Cossack Baroque" or "Ukrainian Second Renaissance".

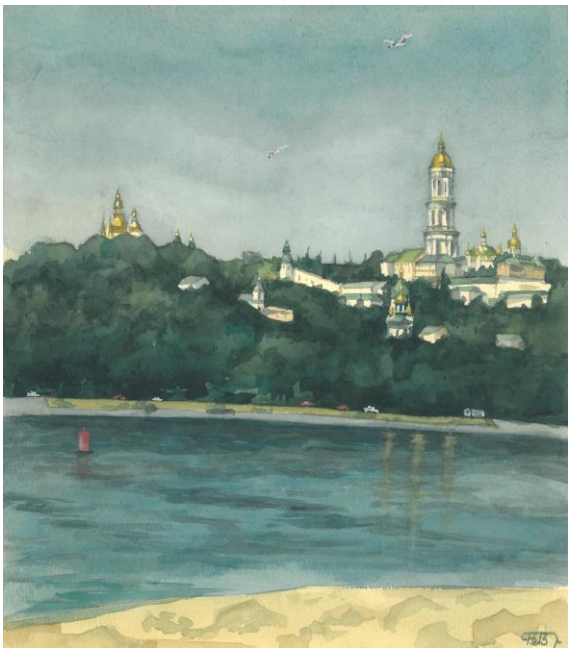


Fig. 3. View from the Dnipro river to the territory of the Kyiv Pechersk Lavra. Watercolour by Yulia Ivashko

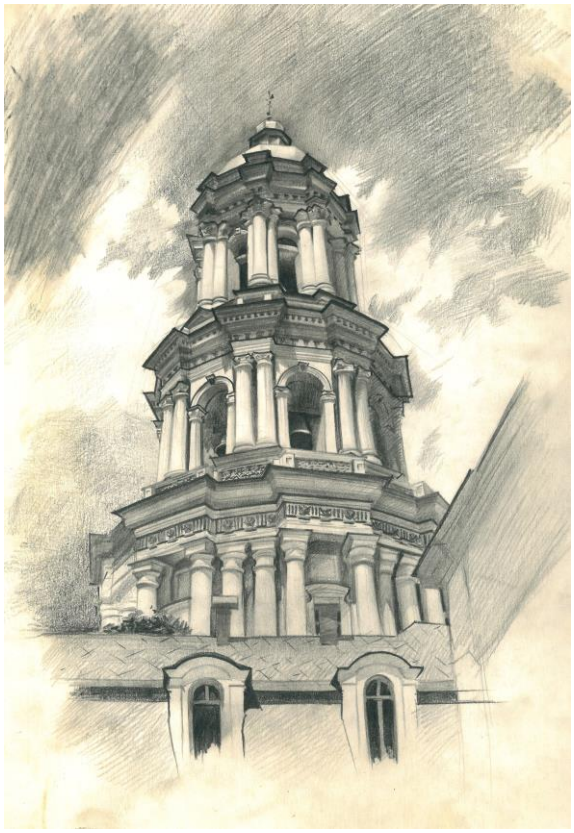


Fig. 4. The Big bell-tower of the Kyiv Pechersk Lavra. Drawing by Yulia Ivashko

The gardens had systems of terraces, staircases with balustrades between levels and elaborate "view pictures" that helped to the cloistered praying and thinking about eternity.

In the design of the monastery gardens, the scrupulous and considered work of gardeners was observed; there were the openings of the most picturesque views from the terraces and sightseeing platforms. The entire landscape compositions were created from plants and trees; with the buildings, they were connected by the galleries and passages.

An engraving of 1702 depicts the Church of the Exaltation of Holy Cross of the Kyiv Pechersk Lavra on the terrace of the southern slope of the Lavra Hill [15]. Back in the days of Athanasius Kalnofoiskyi, the gardens were planted on the hillsides adjacent to the church.

The unique figurative perception of the ensemble of the Near Caves, is mostly determined by the accentual hostile terrain since from the territory of the Near Caves, a beautiful view of the Dnipro and its steep bank can be seen (Fig. 3, 4).

The rugged terrain also determined the principles of the location of the buildings of the Far Caves on two natural terraces on a high hill. Initially, the wooden staircase with balustrades was built to walk into the Far Caves along a steep slope; it was replaced by a covered gallery by 1695.

Since the natural environment becomes one of the principal factors in the placement of an Orthodox church or a monastery, if the natural environment was insufficient (for example, there was little greenery, there were no water bodies), gardens or forest parks were established and a system of artificial ponds was established based on the existing natural sources (the examples are Kytaievo and Holosiivskyi heritages – suburban cloisters).

Founded in 1716, Kytaievo Monastery arose on the site of prehistoric settlements of the 3rd–1st millennia BC. Later there was an ancient Slavic settlement at the foot of Kytaievo Mountain and the fortified Kyivan Rus Kytaievo settlement of the 10th century. It is with the period of Kytaievo settlement that researchers most often attribute the emergence of the developed system of the underground passages in the thickness of the mountain. The main temple of Kytaievo Monastery was the Holy Trinity Church, built during the Hetmanate era, however, the buildings were added in the 19th century.

As mentioned earlier, during the Hetmanate era, the synthesis of architecture and picturesque natural surroundings becomes the characteristic feature. In the case of suburban monasteries, a symbol of the salvation of monks from the futility of life in cities, the symbolism of the natural elements manifested itself most clearly, because they were not dominated by the strict rules of regular urban development. So, in Kytaievo Monastery, such symbolic natural elements with a deep sacred meaning were Kytaievo Mountain – the local symbol of the ancient Greek mountain Athos, a birch with three trunks near the principal church – the symbol of the Trinity, etc.

The picturesque monastery ensemble was enlarged by the system of artificial lakes above which the monastery stands, lush natural greenery,

steep paths leading from the lakes along the hillside to the caves. From different levels, beautiful view paintings open up, in which architecture, complex terrain, water bodies and landscaping are merged. The oldest Kyiv oak, whose age is more than three hundred years, is preserved here. All view pictures seemed to be divided into three levels: paintings of the lower level, from lakes to a high mountain with caves and steep paths and to the opposite bank with a temple and monastery buildings; the middle-level views – from the wooden staircase to the caves, to a system of artificial ponds and the opposite bank with the principal emphasis of the Holy Trinity Church; the pictures of the upper level – from the platform in front of the entrance to the caves, opening only to the opposite bank, where the temple and buildings could be watched from above, on the domes, while most of the buildings are hidden in greenery.

The similar principles were applied in the Feofaniia Monastery, which was previously out of Kyiv, and now it is a part of the city. The Feofaniia Monastery arose later, at the beginning of the 19th century, on the initiative of the vicar of the St. Michael's Golden-Domed Monastery Feofan Shiyanov as his suburban residence for solitude. When planning the territory, the principal argument for placing the monastery in this place was the presence of a complex picturesque relief with alternating hills and lowlands. At the highest point of the hill, the central Panteleimon temple was built, which is visible from different points from afar, and at the foot of the hill, there is a system of lakes on one side and a valley with a natural stream on the other. During Feofan Shiyanov, to the left of the central road to the temple, a large oak grove was planted and it has been preserved to this day. The oak grove like a curtain, backstage that opens up a magnificent panorama of the mountain and the distance with the majestic temple of St. Panteleimon.

The perception of the central churches in Kytaievo and Feofaniia Monasteries is fundamentally different: in Kytaievo, there is no such overview of the entire territory from distant points, the heritage from different sides was surrounded by high hills with dense vegetation, which mostly "hides" the buildings. On the contrary, in Feofaniia, the emphasis is precisely on revealing architecture and distant view perspectives, the green massif "recedes", not obscuring the development, but only supplementing it. The paths to the left of the temple lead to the oak grove and a system of lakes in which the temple is reflected spectacularly, to the right – to a picturesque natural area with alternating hills, natural streams and springs with healing properties.

Just as in Kytaievo Monastery there are natural symbols – carriers of the sacred meaning (Kytaievo hill, a triple tree), there are such symbols in the Feofaniia Monastery. This romantic area reminded Feofan Shiyanov of the biblical places he had visited, so he immortalized these places in his suburban residence: there is the Kidron Valley stream, the Valley of Josaphat, Mount Tabor, Elyon Comparing the two historical heritages, two various methods of architecture and landscape combination are identified – the first, without the possibility of viewing architecture from distant points due to the surrounding hills covered with trees, the second – with the feasibility of viewing architecture and its dominance over natural elements – hills, valleys, water bodies and landscaping.

Both of these methods differ from the previously mentioned the third one, illustrated on the examples of Kyiv and Chernihiv, when most of the central cathedrals and monasteries are located on the upper edge of the high bank of the river, and in this case, the perception of architecture in combination with the landscape is most vivid due to the maximum identification of natural qualities of such accentual forms of the landscape as mountain slopes, precipices and ravines.

That is how the constructions of the Holy Trinity Ioninskyi Monastery, the Upper and Lower Lavra, the St. Michael's Golden-Domed Monastery, the St. Andrew's Church in Kyiv, the Yeletskyi Dormition Monastery and the Holy Trinity Monastery in Chernihiv are perceived [7; 8]. In particular, in case of the Kyiv Pechersk Lavra, one can speak of a terraced hillside development with the simultaneous development of the monastery ensemble at several levels throughout the high slope, observing the principle of buildings location hierarchy.

The most significant Assumption Cathedral – the Mother of God Church, the Big Bell Tower, the Refectory – are placed on the upper sites, with the possibility of their comprehensive review from distant points, less significant – on the slope in the direction from top to bottom (Fig. 4).

An example of placing the monastery on the upper edge of the hill is the most advantageous, however, there are known cases of placing the monastery not on the mountain, but at a specific height from the water, when a higher mountain rises behind it. An example is the Vydubychi Monastery in Kyiv (Fig. 5, 6). This historical monastery, founded in Kyivan Rus times, experienced a period of decline during the time of the Uniates and a heyday starting from the Hetmanate era. The central temple of the monastery is the St. George's Cathedral, which is rightfully considered the most harmonious decision of the five-dome cross in terms of a tower-type church built during the period called "Ukrainian Cossack Baroque".

Fig. 5. View from the New Botanical Garden to the Vydubychi Monastery. Watercolour by Yulia Ivashko

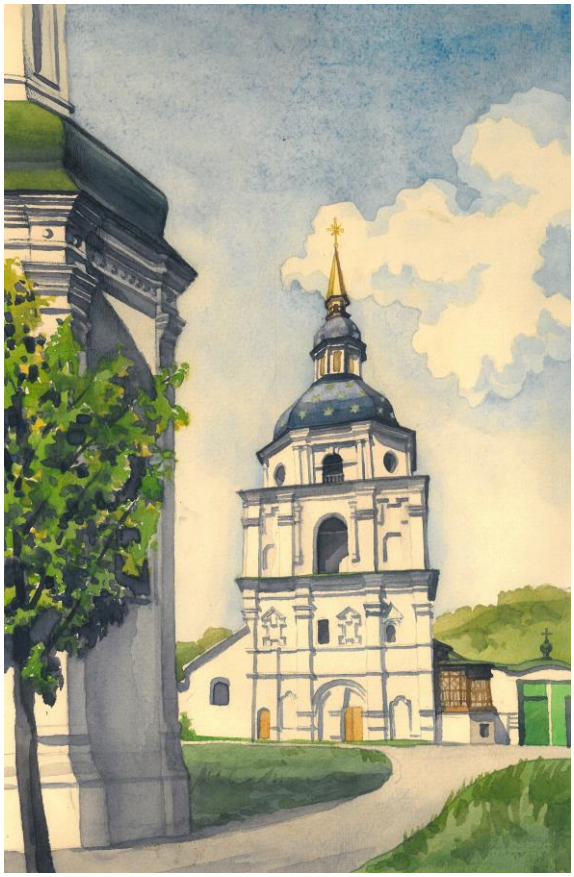


Fig. 6. Territory of Vydubychi Monastery near St. George Cathedral. Watercolour by Yulia Ivashko

Placing churches and monasteries along the upper edge of the high right bank of the Dnipro river gave aesthetic, urban planning and compositional advantages, but it created the principal difficulty of construction on subsiding landslide soils. So, the church of the Archangel Michael, built in Kyivan Rus times, was located directly on the edge of the slope, which as a result of landslide processes led to the collapse of its eastern part with an altar and a dome. Even the retaining wall built by the Kyivan Rus architect Petr Miloneg could not prevent it. It is known that the Assumption Cathedral of the Kyiv Pechersk Lavra, the St. Michael's Golden-Domed Cathedral of the St. Michael's Golden-Domed Monastery, St. Andrew's Church constantly suffered from these problems. The problem was aggravated by the watering of nearby monastery gardens, plots and flower beds. Thus, the maximum use of the aesthetic expressiveness of accented landforms gave advantages in creating dominants and aesthetic perception of the object. However, ignoring the existence of groundwater, the peculiarities of the subsiding soil and the landslide processes led to problems in the statics of buildings. At once after the construction beginning, cracks appeared in the walls, domes and load-bearing structures because of the subsidence of basis and soaking of loessial soils.

The old methods of restoration brought only a temporary effect, and the tangible results were achieved only in our time by using the reinforcement of footings, foundations and walls with piles, especially, the vertical, inclined and horizontal bored piles.

In this case, they considered options for placing monasteries on the high bank of the river, which eventually became part of the city. Another example of this type of placement is a suburban monastery, visually remote from settlements, on the riverbank, amid the river and nature untouched by civilization. A vivid example of such a monastery is the Mhar (Lubny) Transfiguration Monastery, located in the contemporary Poltava region, above the Sula River, on Mount Mhar, surrounded by the Mhar Forest. Like the rest of the Orthodox monasteries, the Mhar monastery did not start from anything, but on the site of an earlier monastery dating from the 13th century, although the official date of its creation is 1619.

Like other famous monasteries (the Kyiv-Pechersk Lavra, the Vydubychi Monastery, St. Michael's Golden-Domed Monastery, etc.), the Mhar monastery experienced a period of the maximum prosperity also during the Hetmanate period, when the main buildings were being built. In 1692, the principal Transfiguration Cathedral and the baroque multi-tiered bell tower were built in the Mhar monastery. Very soon, the monastery became a symbol of isolation in nature, and perhaps this fact is the reason that prompted the Constantinople Patriarch Athanasius to end his earthly path here during his last trip in 1654. According to the legend, he often prayed on a distant hill, where the Annunciation Church was subsequently built, and the monastery landscape garden with flower beds was laid out. One of the peculiarities of monastery life was the maximum use of landscape features. From the first years of the founding of the monastery here, monks were engaged in landscaping the territory of the monastery and the surrounding areas. At the beginning of the 20th century, the monastery was decorated with an aisle of limes planted by the Holy Hierarch Joasaph Bilhorodskyi (1705–1754

years of life) when he was prior of the Mhar monastery in 1737. The oak tree was also considered a shrine, in the shadow of which, according to the legend, Patriarch Athanasius prayed. Since the time of Peter I, the monastery became famous thanks to its phyto-pharmacy.

The monastery was in decline during the dominance of the atheistic ideology, starting from the period of independence, its revival began, when in parallel with the restoration of buildings a green zone, flower beds, ponds with turtles, a monastery zoo was built.

An analysis of the urban planning design for the urban and suburban monasteries of the Left Bank and Naddnipriansh chyna during the Hetmanate era is represented by two principal schemes, the first of which provides for the continuous neighbourhood of courtyards for various purposes, the second "square in square" scheme provides for the allocation of an ceremonial "front" square space inside the fenced monastery territory around the principal cathedral, limited by the main facades of the cells, the refectory and the abbot's chambers, with the economic function of the space between the outer and inner square. There were cases when the features of the existing landscape did not allow making the layout of the square geometrically correct (The Holy Trinity Monastery in Chernihiv).

A comparative analysis of the monastic gardens organization techniques in the most famous monasteries of the Hetmanate of Ukraine in the Baroque period was carried out. In particular, different approaches to landscaping of urban and suburban monasteries were noted.

In urban monasteries, the area of gardens was smaller. Such monasteries, as a rule, originated in ancient times and had a layout structure adapted, including for defence and siege, i.e. gardens were located near the outer defensive walls with towers. As the area of the monastery was limited, it was primarily orchards and gardens with apiaries.

Instead, suburban monasteries and hermitages were not limited by urban requirements and territory, so they form, along with purely functional orchards and gardens, recreational irregular parks with maximum preservation of the natural environment and the inclusion of natural or artificial reservoirs.

It can be said that to some extent such a country monastery park becomes a specific analogue of the Chinese garden, because in both cases localities and reservoirs were given symbolic names (in monasteries – biblical, in Chinese gardens – based on lines of poems, legends or landscape specifics). However, such an approach to the poeticization of landscape design is characteristic of many civilizations and has been known since ancient times.

Unsurprisingly, despite the inconsistency in the image and purpose of the orthodox monastery park of the Feofaniivska Hermitage near Kyiv and the private Chinese garden Zhouzhenyuan in Suzhou, they are based on similar landscape techniques – accent landforms and reservoirs, which are given to the poets. reception of "green screen", when deliberately created the impossibility of viewing the entire garden, and one landscape picture follows another, creating the effect of infinity of space.

In the Zhozhenyuan Garden, the mountains are made of artificial stone, and there are gazebos, in the Feofaniivska Hermitage, hills are natural, and on the highest of them the Church of St. Panteleimon is placed, which offers unique views of natural ravines and oak forests. However, only the plane in front of the temple is open, on both sides of which there are picturesque groves and ravines with natural streams and winding paths, which seem to be "blocked" by "green screens".

Here it is worth mentioning the common technique of terraces and bridges arrangement, which revealed the landscape, as well as the chamber nature of the country monastic gardens and orchards in Suzhou. Despite the different religious content and cultural differences, such gardens performed the same function – merging with nature, solitude and meditation. This indicates that different civilizations at different times, independently of each other, used similar landscape techniques, although they embodied different species of greenery.

Some similarities can be noted in the landscaping of the Kytaivska Hermitage near Kyiv and the gardens of Suzhou. As in the park of the Feofaniivska Hermitage, the landscaping around the church is arranged, and around the reservoir that surrounds the ensemble, there are natural mountains with untidy greenery. Thus, it is a local variant of landscape techniques, which in China were called "garden in the garden", i.e. a smaller garden can be seen larger, and "landscape borrowing", when the ensemble includes perspectives of long-range plans behind the monastery. Here the theme of "lake and mountains" is also embodied by local species of trees and on the local steep terrain, although without mythological connotations, the main temple is located above an artificial lake, and hills with caves and steep paths rise above it. From the site in front of the caves in the frame of greenery you can see only the domes, the impression of a picture in the frame, and this technique is also typical of Chinese landscape design, although it is embodied differently. Architecture here does not dominate over nature, but merges with it as much as possible.

In the East, the private garden was the personification of the ideal natural world, in the

monasteries the garden became the personification of paradise on earth. In China, gardens were decorated with certain symbolic flowers and plants, and in monastery gardens, plants and trees were planted that had a certain dogmatic meaning and symbolized Christian virtues.

Conclusion

Since ancient times, the natural environment was considered as a component that enhanced the quality of Christian architecture. In Ukrainian folk architecture, it happened intuitively, taking into account the deep pre-Christian traditions of the deification of nature and the ineradicable pagan rites and superstitions. In the villages the churches were mostly wooden, they were built on the highest place, if there was a river or lake nearby, then they were also included in the overall composition. The dominance of particular tree species on the territory of different districts of the Kyiv province determined the timber material used in construction and immediately effected the size and durability of the churches being built. The churches on the Right Bank and Left Bank Ukraine were built of quality wood (oak, pine), and that's why they were large in size, tall and durable. The wooden churches against the background of the picturesque nature were described by travellers, poets and writers, depicted by artists.

The poetry and lyricism, peculiar for the Ukrainian people, manifested in the glorifying of nature, was transferred to church architecture, which is considered in the natural environment. Folk traditions were expressed during the period of national revival, called the "Hetmanate era". This period was marked by the flourishing of Orthodoxy, the emergence of new monasteries and churches. On the example of many famous churches and monasteries of the Right-Bank and Left-Bank Ukraine, one can notice that their natural environment was an integral part. The place for temples and monasteries was chosen taking into account many natural factors that contributed to the transformation of temples into urban dominants and formed picturesque species paintings.

Gardens and parks in the monasteries of Hetman Ukraine embodied the poetry on which the architecture of the Ukrainian Baroque is based. The main features of the "Cossack Baroque" in religious buildings were as follows: elegance and harmony of the silhouette, the similarity of the tower tops with domes to tall poplars, the impression of rising, the widespread use of phytomorphic plant decor in ornamentation. That is why slender trees around and lush flower beds were so organically combined with baroque architecture.

Despite the location of monasteries in different regions of Hetman Ukraine, on the Right Bank of Dnipro or on the Left Bank, based on the analysis of typical landscape techniques of monastic gardens of Hetman Ukraine of the Baroque period, common basic landscape techniques were determined, depending on whether it was an urban or suburban monastery:

1) in urban monasteries – arranged flower beds and gardens of smaller area, mostly with fruit trees, located near the defensive walls or on the steep bank of the river with the possibility of exploring long-term prospects, often without ponds in the garden, terracing gardens and communication through bridges and galleries, from which the best landscapes are revealed. In orchards and flower beds, trees and plants were used mainly with a certain symbolic meaning;

2) in suburban monasteries – arranged orchards, which turn into an irregular park area with alternating landscape paintings with features of maximum naturalness and poetic names and with the inclusion of accent landforms and natural or artificial reservoirs. Trees and plants specific to a particular region were used.

The main techniques of relations between landscape and architecture are highlighted:

1) Architecture dominates the natural environment, the main building is at the highest point and is observed from all sides from a distance, and the natural environment complements its image;

2) Architecture is subordinated to the natural environment, the main building is not in the highest emphasis and is perceived in fragments from different points of view, the main thing is the natural environment, enhanced by the means of architecture;

3) The architecture maximally enhances the accent relief, crowning its upper edge, on the slope natural greenery is placed.

Landscape techniques that, in addition to Ukraine, were used by other nations are identified:

1) "garden in the garden", when behind a smaller orderly garden a larger unorganized one is placed;

2) "borrowing the landscape", when distant perspectives are included in the figurative perception of the object;

3) "screen technique", when green areas are deliberately blocked by specially planted trees and shrubs to make it impossible to view the area from a distance and create the effect of changing landscape pictures and the infinity of space;

4) "landscape as a picture in a frame", when the landscape is perceived in the gap between the trees;

5) "Hidden meaning", when a planted plant or tree actually expresses a certain philosophy, dogma or human virtues (this is facilitated by the poetic, sacred or poetic name of the building in its natural environment or landscape painting, which suggests certain analogies and emotions).

This indicates that different peoples in different ways came to the introduction of similar techniques of landscape design.

References

1. **Yurchenko, P**. *Wooden architecture of Ukraine*. Kyiv: Budivelnyk, 1970, 191 p.
2. **Kilesso, S**. *Kyiv-Pechersk Lavra*. Kyiv: Budivelnyk, 2004, p. 111–114.
3. **Lohvyn, H.** *Across Ukraine: ancient art monuments*. Kyiv: Mystetstvo, 1968, 463 p.
4. **Nechui-Levytskyi, I.** *Works (in 2 volumes.* Kyiv: Dnipro, 1977, vol. 1 – 518 p, vol. 2 – 518 p.
5. **Orlenko, M.** *The St. Michael's Golden-Domed Monastery: methodological foundations and chronology of reproduction: Scientific publication.* Kyiv: Hopak, 2002, 160 p.
6. **Orlenko, M.** *The Dormition Church of the Kyiv-Pechersk Lavra: methodological foundations and chronology of reproduction.* Kyiv: Phoenix, 2015, 832 p.
7. **Pavlutskyi, H.** *Antiquities of Ukraine. Part 1. Wooden and stone temples*. Kyiv: Printing House of Saint Vladimir Royal University, 1905, 124 p.
8. **Shcherbakivskyi, V.** *Wooden churches in Ukraine and their types*. Lviv, 1906. 23 p.
9. **Taranushenko Stepan.** *The monumental wooden architecture of the Left-Bank Ukraine*. Kyiv: Budivelnyk, 1976, 376 p.
10. **Vecherskyi, V.** *The architectural and urban planning heritage of the Hetmanate era. Formations, research, protection*. Kyiv, 2001, 350 p.
11. **Vecherskyi, V.** *The heritage of Urban Planning of Ukraine: Theory and Practice of Historical and Urban Planning monument protective Researches of Populated Places*. Kyiv, 2003, 560 p.
12. **Vovk, Fedir.** Studios on Ukrainian ethnography and anthropology. Kyiv: Mystetstvo, 1995, 336 p.
13. **Zakrevskii, N.** *Description of Kiev: newly processed and significantly multiplied edition. With pictures and drawings*. Moscow, 1868, 980 p.
14. **Zavada, V.** *Features of the formation of the Baroque style in the monumental wooden architecture of Polissia. The architectural heritage of Ukraine*. Issue 1. Kyiv: Research Institute of History and Theory of Architecture and Art, 1994, p. 113–123.

AUTHORS:
Denys Chernyshev. A specialist in a sphere of ecological architecture**.** Vice-rektor, Doctor of Technical Science, Professor, Kyiv National University of Construction and Architecture, 31, Povitroflotskyi Avenue, Kyiv, Ukraine. E−mail: denis01011978@ukr.net
Yulia Ivashko. A historian of architecture and landscape architect. Doctor of Architecture, Professor, Nostrified doctor habilitatus, Kyiv National University of Construction and Architecture, 31, Povitroflotskyi Avenue, Kyiv, Ukraine. E−mail: yulia-ivashko@ukr.net
Dominika Kuśnierz-Krupa. Architect and Landscape Architect, Architectural historian, Doctor of Engineering (Architecture, 2010), Associate Professor at the Faculty of Architecture (2015), Head of the Chair History Architecture, Urban Design and Art., Cracow University of Technology; Podchorążych Street no 1, Cracow, Poland. E−mail: dkusnierz-krupa@pk.edu.pl
Author of 5 monographs and about 100 scientific articles. Member of Association of Monument Conservators, ICOMOS, International Planning History Society and Urban History Association.
Topical Editor (history of urban design, cultural landscape) of Wiadomości Konserwatorskie – Journal of Heritage Conservation. Expert of The Minister of Culture and National Heritage (protection of historic urban layouts and cultural landscape).
Andrii Dmytrenko. An urbanist and landscape architect. Candidate of Technical Sciences, Associate Professor. National University "Yuri Kondratyuk Poltava Polytechnic", Educational and Scientific Institute of Construction and Architecture, 24, Pershotravnevyi Avenue, Poltava, Ukraine. E−mail: metr5555@ukr.net

Kopsavilkums. Rakstā analizēta dabiskās vides ietekme uz kristīgās baznīcas dizaina principiem. Aplūkota un pētīta Ukrainas pareizticīgo baznīcu arhitektūra no vēsturiskajiem aspektiem līdz mūsdienām. Pētījumā iezīmējās kurss jaunu pareizticīgo baznīcu izveidē, kas ir vērsts uz zaudēto seku atjaunošanu. Šādos procesos uzmanība tiek likta uz dabisko vidi, baznīcas tiek celtas parku teritorijās, meža parkos, ezeru krastos, ko ieskauj dekoratīvo apstādījumu dobes. Pētījuma aktualitāti izskaidro daudzo pareizticīgo baznīcu klātbūtne Ukrainā. Pētījuma aktualitāte izskaidrojama ar to, ka Ukrainā atrodas liels skaits pareizticīgo baznīcu – gan arhitektūras pieminekļi, gan jaunuzceltie, kurus tradicionāli ieskauj dārzi, parki un dekoratīvo apstādījumu dobes. Tāpēc svarīgi objektu restaurācijas un jaunas celtniecības laikā saprast gadsimtu gaitā izveidojušās un pilnveidotās ainavu dizaina iezīmes.

DOI: 10.22616/j.landarchart.2020.17.03

The model of trees for the restoration of historical manor parks in Estonia

Nele Nutt, Ardo Kubjas, *Tartu college, School of Engineering, Tallinn University of Technology*

Abstract. The aim of this article is to work out the methodological basis for the restoration of historical manor parks according to the requirements of the Florence Charter. This is why the park is not studied as an object of biodiversity but as a built monument and an architectural piece, whose composition is mainly created by woody plants particularly trees.

The purpose of the current research was to clarify the proportion of examples of distinct tree species in manor parks today and to determine the main tree and shrub species originally used in manor parks. Working out the model for the composition of stands of trees in a historic park. The model for the composition of stands of trees in a historic park was developed. The article summarizes the results of a survey what is a part larger study that explores and understand the key characteristics of Estonian Manor Ensembles and parks.

Keywords: historical parks; dendrology; tree species; manor park; natural species

Introduction

Manors and their parks as a legacy have been an interest of Estonian researchers and restorers since the 1970s when an extensive inventory of manors was carried out [1-4]. A lot of scientific research has been done about parks, including theses. There have been studies about the structure, style and plant material of parks [5-21], the iconography of parks, its meanings and aesthetics [22-29]. The problems of invasive tree species have been pointed out [30-33] botanical composition of parks have been dealt with [34-38] and issues concerning biodiversity and restoration have been dealt with [39-40]. The studies have also included research about large-scale trees, diversity of species and alien species [41-56]. The researchers have described manors' and manorial parks' history [57-40], paid attention to the national protection of parks [64] and put together encyclopedic overviews [65-66]. In addition suggestions for park restorations have been compiled and they include lists of recommended species [67-68].

Different authors have studied biodiversity [69] both in national parks [70] and urban parks [71] and recreational values of parks [72] but they have not studied the park as an architectural piece whose architectural character is primarily created by stand of trees.

Regardless of the previously mentioned long list, which describes the variety of studied questions, the researchers have not focused on the main volume of the park and on the material that forms it. The park benches, pavillions and flowerbeds have been destroyed, but the enduring trees give a good idea about the layout and general historical look of the park. Many manorial parks, which date back more than 150 years, have been unkept for a long time. As the parks get older, the matter of renewing the stands of trees become more topical and the need for historic object materials research results increases. This article is based on the results of a study [10] about the planning of Estonian Manor Ensembles.

Material and Methods

The input data was received from the detailed inventories in 2003-2009 and all of these parks an additional inventory was carried out in 2012 when the information was renewed and specified.

The criteria for the selection of inventories included in the research were as follows:

- the inventory was carried out less than ten years ago;
- the inventory dealt with individual trees, not groups of trees;
- the inventory specified the species and the diameter at crest height or the perimeter at crest height of trees;
- the inventory was carried out using similar methodology;
- the park was in the countryside;
- the park was a historical manor park;
- the park was founded in English style or redesigned to English style in the 19th century.

Secondary data was used in the research. The arrangement of information consisted of summarizing and concentrating the primary data. The information about groups and allotments were removed and the data from additional inventories was added (specifications about the allotments). Descriptions about the species (sp) and the most common specie were summarized (mainly with the indigenous specie). The final selection of 14582 specimens included the nominal characteristic which was the name of the specie (total of 206 species). The sample included 14582 specimens from 17 historical parks of different size (3.0 to 21.0 hectares), of different diversity of species (12 to 120 species) where the amount of growing specimen range from 211 to 1754 and of different eras ranging from 18th to the beginning of 20th century all located in different parts of Estonia (Table 1).

TABLE 1

Summary table of descriptive values of the sample

Queue no.	Object name	Year of the inventory	No of trees	No of species	Area (ha)	Foun-dation period	Location coordinate	
							X	Y
1	Hummuli manor park	2008	1263	39	11.0	19.-20. c.	6420226.3	622066.4
2	Härgla manor park	2007	211	16	5.0	19. c.	6551702.7	551469.3
3	Kiidjärve manor park	2009	602	26	3.0	17.-18. c.	6447826.1	677311.7
4	Kukruse manor park	2009	1318	41	5.5	19. c.	6587874.2	690912.1
5	Kuremaa manor park	2006	1174	48	21.0	19. c.	6513608.0	646771.0
6	Lõhavere manor park	2009	228	25	11.5	19. c.	6490570.1	586415.2
7	Mäetaguse manor park	2004	716	13	9.5	19. c.	6569682.4	687886.9
8	Pagari manor park	2007	1517	48	8.0	19. c.	6573781.9	692717.0
9	Püssi manor park	2009	532	43	7.0	19. c.	6585561.8	673083.1
10	Riidaja manor park	2006	1074	33	9.0	18.-19. c.	6441002.6	611874.2
11	Rogosi manor park	2003	220	28	3.0	18.-19. c.	6392434.4	684388.6
12	Rõngu manor park	2008	958	29	10.0	18.-19. c.	6448102.3	631189.6
13	Räpina manor park	2010	1754	120	8.5	19. c.	6444810.7	703400.0
14	Saku manor park	2007	890	60	9.5	19.-20. c.	6573613.6	537981.9
15	Sürgavere manor park	2008	255	12	3.0	18.-19. c.	6483863.6	588411.0
16	Unipiha manor park	2010	515	18	4.0	19. c.	6460174.0	653205.9
17	Õisu manor park	2008	1355	47	12.5	18.-19. c.	6452002.5	590769.1
	TOTAL		14582		141.0			

Methodology

Dendrological inventory

In order to get an overview of the condition and the composition of the historical park, data was gathered on the basis of dendrological inventory methodology. Inventory was made up of two phases: fieldwork and camera work. Data collected during fieldwork was put together as a summarizing report. Actualized plan of trees stands for the inventory level (single tree in scale of 1:500) was used as the base plan for fieldwork. All the trees with a diameter larger than the agreed size (usually 6 cm) and groups of shrubs growing in the area were marked on this plan.

All the trees and shrubs were evaluated in order to assess them on a single tree level. The diameters were measured with the precision of one centimetre. On a tree level, the plot was evaluated separately and its composition of species was described with the compositional formula. All main species' average diameters at breast height, heights, main parametres and locations of significant specimens, conditions of trees (by species if neccessary), health, density (pcs/surface measurement unit) and et cetera, were measured. The diameter at breast height (1.3 m from the root crown), the height and the width of the crown was measured on trees. For multi-trunk trees all the diameters of different trunks and the estimated trunk height were measured. If the branching started from the ground, they were considered as separate trees. If that height was between 0.7-1.3 m, then the diameters were measured 0.6 m above the branching point. The shrubs' diameter was measured only when the plant was shaped as a tree and the diameters were more than 6 cm. Tree caliper with an accuracy of 1 cm (diameter) or a flexible tape measure (circumfernece) was used for measurements.

This research uses the tree diameter at breast height data based on the dendrological inventory methodology and the level of accuracy depends on the precision of the tree caliper (cm), the experience of the person who inventorys and the tree's peculiarities (the shape of the trunk's cross section).

Dendrological inventory

The results of statictical analysis of data collected in dendrological inventories enabled to create a compositional formula for stands of trees in parks, on which scientific restoration can be based on.

Statistical data processing package R was used for data processing.

Descriptive statistics were used to characterise the division of woody plant species park by park. The woody plants were counted by species and the frequency of species appearances was described with a histogram of distribution. On the histogram

the species were ranked in growing order of occurence frequency on the y-axis and the percentage of occurence frequency on the x-axis.

In order to analyse the occurence frequency of species with a same type identifier, the data was grouped and coded.

The data was grouped as follows:

- by the shape of the stem or development: tree, shrub or other;
- by the phylum: angiosperms and gymnosperms;
- by heritage: indigenous or exotic.

In order to analyse the occurence frequency of different groups and sub-groups, the percentage of distribution for each park, for the whole sample and the difference between the park and the sample, was calculated.

Regression analysis was used for creating a mathematical model that describes the relations between characteristics. Simple random sampling was used for data collection to compile a system of equation based on 100 samples. The equation was solved. Linear regression equation coefficients were found by using the least squares method. The model was evaluated through the average deviation of dependent variable values. The model was tested for 17 parks.

Results

Proportional distribution of woody plants according to the type

Although there are 206 names of species in the species list (Table 2), majority of the park consists of a small part of them. Regardless of the number of species in the park, there is one main specie dominantly prominent in every park, a couple of species with a little bit smaller frequency of occurence than the main specie and a large quantity of species with a very low frequency of occurence.

TABLE 2

Overview of the research results

Item	Sum	Percentage
Number of species	206	100.0
Number of tree species	106	51.5
Number of deciduous species	75	70.8
Number of coniferous species	31	29.2
Number of shrub species	100	48.5
Total number of examples	14582	100.0
Total number of examples trees	13721	94.1
Number of deciduous trees	12285	89.5
Number of coniferous trees	1436	10.5
Total number of examples of shrubs	861	5.9

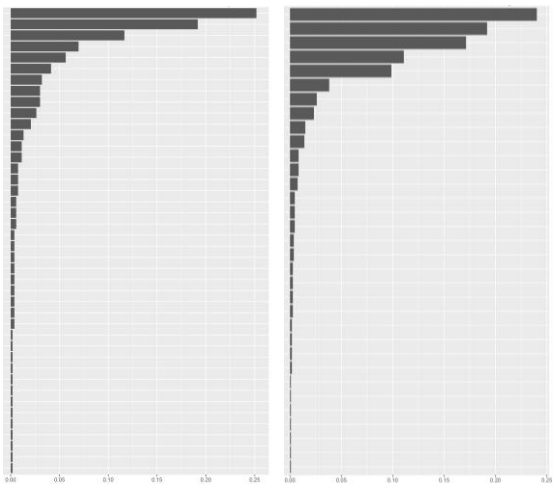


Fig. 1. Histograms of species' occurence frequency on the Püssi (left) and Riidaja (right) manor park

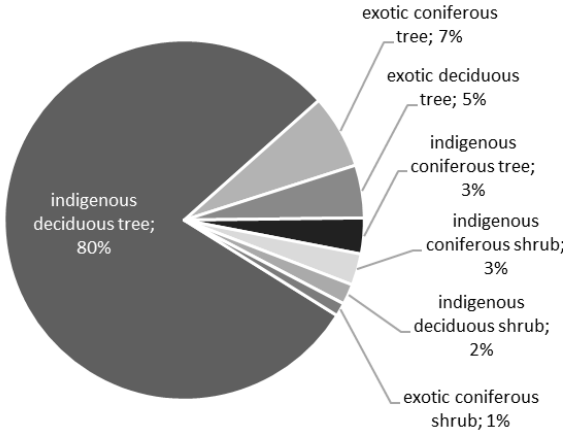


Fig. 2. The distribution of woody plant types

The species distribution of plant material in a park is portrayed by frequency of occurence histograms (Fig. 1). The occurence of species in one study object is characterized by a non-linear distribution which rises from left to right and portrays the increasing proportion of species in the park.

Descriptive statistics showed that six species form approximately 80 % of all species and five out the six are indigenous deciduous trees and only one indigenous coniferous tree. All of the five indigenous deciduous trees were broad-leaved species (there are 6 indigenous borad-leaved deciduous tree species growing in Estonia and all of them can be found in parks) and four of them formed 69 % of the total number of park trees.

Based on the results of the analysis it can be said that the material that forms today's general architectural appearance is largely of the same type.

The majority of the park consists of woody plants which are trees (average of 94 %). The percentage of shrubs was small (average of

6 %). The origin of tree species is predominantly indigenous (average of 86 %) and trees of exotic origin made up only 14 % of species. The deciduous trees significantly exceed the number of coniferous trees (average of deciduous trees is 87 % and of coniferous trees 13%, indigenous trees 86 % and 14 %). The combination indigenous deciduous tree made out of three types forms at average 80% of the park (Fig. 2). A comparatively small part of the population (average of 20 % in total) contains rest of the combinations.

The regression analysis done park by park showed that the proportion of deciduous trees frequency of occurence in parks is very similar and remains close to 80 %. The results are similar park by park.

The proportion model of majority tree species

Preservation of a park expects long-term periodic renewal programmes which are derived from the indigenous park species and customs developed in the region [73]. In order to follow this principle it is neccessary to have an exact knowledge about the region's typical composition of stands of trees in parks. When compiling restorational principles for a historical park, it is not enough to identify the special accent and exotic trees but it is inevitable to evaluate the part which forms the main volume of the historical park. Thus, the species that are typical (indigenous) to the region and form the majority of the park were assessed. The results of the analysis enabled to create a park model which describes the composition of trees in the park and which can be used as a basis for park renewal.

Taking into account the large proportion of indigenous broad-leaved tree species (Acer platanoides, Fraxinus excelsior, Quercus robur, Tilia cordata, Ulmus glabra, Picea abies) they were considered to be majority tree species. Regression analysis was used to create the mathematical model for majority tree species. Simple random sampling of 100 samples was used to compile a system of equation which was solved and the result was a straight line y=0.6924x.

Linear regression equation coefficients were found by using the least squares method. The model was evaluated through the average deviation of dependent variable values.

The model for the composition of stands of trees

A composition formula of park trees was compiled based on the research results. It describes the distribution of most common woody plant types in percentages. The stand of trees in the historical parks is composed of 80 % of the indigenous deciduous trees of which 70 % are indigenous broad-leaved deciduous trees Tilia cordata (Pä), Quercus robur (Ta), Acer platanoides (Va), Fraxinus excelsior (Sa) and 10 % are the rest of the indigenous deciduous trees.

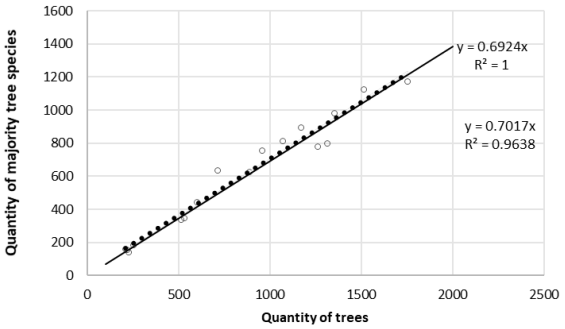


Fig. 3. The proportion of majority tree species in 17 parks is similar to the model (R^2=0.9638)

The combination of exotic and coniferous trees and shrubs form the rest of the 20% of stands of trees.

80 indigenous deciduous trees (70Pä+Va+Ta+Sa; 10 others) 20 others (needle, exotic, shrub).

Discussion

The dendroflora of parks has been studied for a long time. Dendrological inventories have been carried out by Paivel in 1952-1973 and by Ellik and Roht in 1983-1989 [49; 50]. Since 1961 inventories of trees have been done under Tallinn Botanic Garden [74]. The specie or its lower ranking taxon was recorded and larger trees were measured during field work. The character of woody plants turned wild was determined and the renewal of species by seeds or stolons was evaluated [49; 50]. Reviews of parks and woody plant collections (arboretums, dendrological garden) dendrofloras based on inventory data have been published [75-77]. Published articles talk about species richness, the presence of introduced species and the occurence of large specimens. Coniferous alien tree species have been discussed separately. One of the goals of species richness inventories has been the study of species richness which is the basis for dividing the parks into three groups: high, medium and low richness in species [78]. At the same time the species richness is not a measure of value in a historical park, also in the context of the Florence Charter, because the number of species is directly linked to the architectural style of the park. When in the Baroque style it is presumed to use high number of woody plants of same specie, then the diversity of species is inherent to the English park. As architectural objects Baroque and English park are equal in value. The age value of the Baroque park, which is poor in species, may be considered higher because it was established earlier. The species richness in parks has been considered valuable from the point of view of nature protection. Hereby it is interesting that exotic species form a major part of the species richness and some of them pose a potential risk of/for invasion. Therefore, the values in parks can be controversial as the value

of biological diversity, important from the nature protection point of view, comes directly from exotic species. There are 81 indigenous woody plant species in Estonia, but in parks there have been found more than 350 different species (including subspecies, varieties). The collected material gives a very throrough overview of the diversity of species in woody plant collections (including parks) but it does not portray the proportion of species, therefore it is not enough to resolve the issues related to the authenticity of the historical park.

Conclusions

As a result of this work methodological bases for the model of trees were created for the restoration of historical manor parks according to the principles stated in the Florence Charter. The sources and materials used enabled to conduct analyses based on scientific principles resulting in types and ages of woody plants and further analysis of the composition of park trees. On the basis of this, it was possible to create a model for the trees composition in the park.

The material of the park is made up of 80 % of woody plants with a bright foliage and trunk and the rest of the 20% contains the diversity of species in the park formed by exotic trees, coniferous plants and shrubs. This proportion of distribution (20/80) characterizes historical parks regardless of the establishment period, size, number of trees growing there, species diversity and location of the park. The first layer of stand of trees in the park is described by the compositional formula: 80 indigenous deciduous trees (70 Pä+Va+Ta+Sa; 10 others) 20 others (needle, exotic tree, shrub).

The Florence Charter states that the preservation of a park among other things expects long-term periodic renewal programmes which are derived from the indigenous species and customs developed in the region [73]. The results of this work are neccessary for the planning of maintenance, preservation, restorational and reconstructive work in Estonian historical parks.

References

1. **Üprus, H.** Mõisaansamblitest ENSVs [About Manor Complexes in Soviet Estonia], Muinsuskaitseamet, 1975, VRV, P-2525. (In Estonian)
2. **Üprus, H.** Mõisaarhitektuuri uurimisest [About the Research on Manor Architecture]. Ehitus ja arhitektuur, 1978, No. 2, p. 3-7. (In Estonian)
3. **Maiste, J.** Mõisaarhtektuuri inventeerimise algus [The Beginning of Manor Architecture Inventory]. Ehitus ja arhitektuur, 1978, No. 2, p. 8-12. (In Estonian)
4. **Nutt, N.** 2011. Helmi Üprus mõisaparkide uurijana [The Heritage of Helmi Üprus – a Study of the Historic Manorial Parks]. *Acta Architecturae Naturalis*, 2011, No. 1, p. 153−160. (In Estonian)
5. **Uustal, M.** *Taimekasutus Eesti mõisaaedades [Plant Use in Estonian Manor Gardens].* Master Thesis. Estonian Agricultural University, 2003. 76 p. (In Estonian)
6. **Tarkin, E.** Eesti regulaarne mõisaansambel maastikus. Uuring maastiku avatuse, mõisasüdame ulatuse ning teekoridoride muutustest [Estonian Formal Manor Ensemble. The Change in Openness of the Landscape,Manor's Heart and Roads]. Master Thesis. Tallinn University of Technology, 2011. 59 p. (In Estonian)
7. **Mihkelson, H.** Eesti 18.–19. sajandi regulaarpark. Pargi ja maastiku suhe [Estonian Regular Park in 18th-19th century. Relationship Between Park and Landscape]. Master Thesis. Tallinn University of Technology, 2010. 66 p. (In Estonian)
8. **Heringas, D.** Eesti 18.–19. sajandi regulaarpark. Pargiruumi säilivus Estonian [18th-19th century regular park. The level of preservation of park space]. Master Thesis. Tallinn University of Technology, 2009. 67 p. (In Estonian)
9. **Vaine, J.** Eesti 18.–19. sajandi regulaarpark. Pargiruumi kompositsioon [Estonian regular park in 18th-19th Century. The Composition of the Park]. Master Thesis. Tallinn University of Technology, 2009. 191 p. (In Estonian)
10. **Nutt, N.** The restoration of nationally protected Estonian manor parks in the light of the florence charter. Ph.D. thesis. Tallinn University of Technology, 2017. 160 p.
11. **Nurme, S., Nutt, N., Hiob, M.** Baroque Park in Estonia. **In:** Landscape & Ruins Planning and Design for the Regeneration of Derelict Places, Genova, 2009, p. 12-13.
12. **Nurme, S., Nutt, N., Hiob, M., Hess, D.** Talking ruins: The Legacy of Baroque Garden Design in Manor Parks of Estonia. ***In:*** *Landscape Archaeology Between Art and Science: LAC 2010: First International Landscape Archaeology Conference, Amsterdam.* Amsterdam University Press, 2012, p. 115–125.
13. **Nurme, S., Kotval, Z., Nutt, N., Hiob, M., Salmistu, S.** Baroque Manorial Cores and the Landscape. *Journal of Cultural Heritage Management and Sustainable Development*, 2014, No. 4(2), p. 166−183.
14. **Nurme, S.** Understanding the role of 18th century Estonian manor ensembles in contemporary planning and conservation. Ph.D. thesis. Tallinn University of Technology, 2019. 246 p.
15. **University of Technology. 246 pp.Saarepuu, T.** Autentsed puuliigid Hummuli, Kiidjärve, Kuremaa, Räpina, Unipiha ja Õisu mõisa pargis [Authentic Tree Species in Hummuli, Kiidjärve, Kuremaa, Räpina, Unipiha and Õisu Manor Parks]. Bachelor Thesis. Tallinn University of Technology, 2011. 83 p. (In Estonian)
16. **Saarepuu, T.** Taastava ajaperioodi probleem Eesti mõisaparkide restaureerimisel ja rekonstrueerimisel Puurmani, Saare, Võhmuta ja Õisu mõisa pargi näitel [The Probleem of Time Period in Restoring and Reconstructing Estonian Manor Parks in the Example of Puurmani, Saare, Võhmuta and Õisu Manor parks]. Master Thesis. Tallinn University of Technology, 2015. 153 p. (In Estonian)
17. **Ratas, L.** *Kukulinna mõisa pargi hoolduskava [Maintenance Plan of The Kukulinn Manor Park].* Bachelor Thesis. Tallinn University of Technology, 2011. 50 p. (In Estonian)

18. **Bassova, O.** Väikeparkide hoolduskavad. Vara, Reola, Vesneri ja Kriimani parkide näitel [Maintenance Plans for Small Parks on the Examples of Vara, Reola, Vesneri and Kriimani Parks]. Bachelor Thesis. Tallinn University of Technology, 2012. 69 p. (In Estonian)
19. **Bassova, O.** Eesti regulaarsete mõisaparkide alleed maastikus [The Main Allées of the Estonian Regulaar Manor Parks in the Landscape]. Master Thesis. Tallinn University of Technology, Tartu College, 2014. 139 p. (In Estonian)
20. **Paalo, P.** Reljeef Eesti regulaarsete mõisaparkide kujunduses 1750–1850 [Relief in the Design of Estonian Regular Manor Parks Between 1750-1850]. Master Thesis. Tallinn University of Technology, 2013. 133 p. (In Estonian)
21. **Nutt, N., Kubjas, A., Kaplinski-Sauk, M**. Eesti ajalooliste mõisaparkide ja metsade puistu liigilise koosseisu võrdluse meetod [A Method for Comparing the Tree Species Composition of Estonian Historic Manor Parks and Forests]. *Agraarteadus*, 2020, No. 31(1), p. 66-69 (In Estonian)
22. **Maiste, J.** Eessõna [Foreword]. ***In:*** *Alatskivi loss ja park: kahe meistriklassi materjale [Alatskivi Palace and Park: Material From Two Master Classes].* EKA Tallinna Restaureerimiskool, EPMÜ Keskkonnakaitse Instituut, 2003, p. 13-19. (In Estonian)
23. **Maiste, J.** Kõnelevad varemed [Talking Ruins]. ***In:*** *Varemed [Ruins].* Eesti Kunstiakadeemia toimetised nr 15. EKA Restaureerimiskooli väljaanded nr. 2., 2004, p. 9-23. (In Estonian)
24. **Maiste, J.** Park ajas ja ruumis [Park In Time and Space]. ***In:*** *Tartumaa mõisad.* Tartu: Sakk ja Sakk. 2005, p. 4-9. (In Estonian)
25. **Maiste, J.** Maastik kui ikoon ja ikooniline maastik [Landscape as an Icon and Iconic Landscape]. ***In:*** *Parkide restaureerimine [Restoration of Parks].* Tartu College of Tallinn University of Technology, Tartu, Estonia, 2008, p. 113-132. (In Estonian)
26. **Maiste, J.** Kolmas silm. Essee ilusast maastikust [The Third Eye. An Essay About a Beautiful Landscape]. Tallinn: Varrak, 2011, 236 p. (In Estonian)
27. **Karro, K.** Pargi ikonoloogia [The Iconology of Park]. ***In:*** *Park on paradiis looduses ja kunstis [Park Is Paradise in Art and Nature].* Tartu: Estonian University of Life Sciences, 2009, p. 130-137. (In Estonian)
28. **Sipelgas, K.** Park – maastik raamis [Framed landscape]. *Aeg ja ruum: uue muinsuskaitse poole [Time and Space – Towards a New Heritage Protection],* 2009, No. 1, p. 45-55. (In Estonian)
29. **Sipelgas, K.** Mõispark kui ettekujutus [Manor Park as an Imagination]. ***In:*** *Park on paradiis looduses ja kunstis [Park Is Paradise in Art and Nature].* Tartu: Estonian University of Life Sciences, 2009, p. 129-129 (In Estonian)
30. **Purik, T.** Looduslikku tasakaalu ohustavate taimeliikide riskihindamine [The Risk Assessment of Plant Species Endangering Natural Balance]. Bachelor Thesis. Estonian Agricultural University, 2011. 52 p. (In Estonian)
31. **Purik, T.** Parkide restaureerimiseks soovitatud võõrpuittaimede riskihindamine [Risk Assessment of Alien Woody Plant Species Recommended for Restoration of Parks]. Master Thesis. Estonian University of Life Sciences, 2013. 67 p. (In Estonian)
32. **Purik, T., Ööpik, M.** Parkide restaureerimiseks soovitatud võõrpuittaimeliikide riskihindamine [Risk Assessment of Alien Woody Plant Species Recommended for Restoration of Parks]. *Acta Architecturae Naturalis*, 2013, No. 3, p. 105-126. (In Estonian)
33. **Nutt, N., Kubjas, A.** Suitability of the Weber-Gut risk assessment methodology used in Central Europe for determining invasive woody plant species in Estonian historical parks. *Metsanduslikud uurimused = Forestry studies*, 2020, No. 72, p. 21-33.
34. **Liira, J., Lõhmus, K., Tuisk, E.** Old Manor Parks as Potential Habitats for Forest Flora in Agricultural Landscapes of Estonia. *Biological Conservation*, 2012, No. 146(1), p. 144−154.
35. **Tuisk, E.** Vanade antropogeensete puistute taimkate põllumajandusmaastikes *[The Vegetation of Old Aged Human Made Stands in Agricultural Landscape]*. Master Thesis. University of Tartu, 2009. 66 p. (In Estonian)
36. **Lõhmus, K.** Colonisation Ecology of Forest-Dwelling Vascular Plants and the Conservation Value of Rural Manor Parks. Ph.D. thesis. University of Tartu, 2014. 68 p.
37. **Lõhmus, K., Paal, T., Liira, J.** Long-Term Colonization Ecology of Forest-Dwelling Species in a Fragmented Rural Landscape – Dispersal Versus Establishment. *Ecology and Evolution*, 2014, No. 4(15), p. 3113−3126.
38. **Lõhmus, K., Liira, J.** Old Rural Parks Support Higher Biodiversity Than Forest Remnants. *Basic and Applied Ecology*, 2013, No. 14(2), p. 165−173.
39. **Sinijärv, U.** Kunst ja loodus pargis. Kujunduslike ja liigikaitseliste eesmärkide ühendamine parkide restaureerimisel ja hooldamisel Saare maakonna looduskaitsealuste parkide näitel [Art and Nature in Parks Combining Design Objectives and Biodiversity Conservation Objectives in Park Restoration and Maintenance on the Basis of Case Studies of Protected Parks in Saare County, Estonia]. *Acta architecturae naturalis*, 2013, No. 3. p. 45-70. (In Estonian)
40. **Sinijärv, U.** Kunst ja loodus pargis. Kujunduslike ja liigikaitseliste eesmärkide ühendamine parkide restaureerimisel ja hooldamisel Saare maakonna looduskaitsealuste parkide näitel [Art and Nature in Parks. Combining Design Objectives and Biodiversity Conservation Objectives in Park Restoration and Maintenance on the Basis of Case Studies of Protected Parks in Saare County, Estonia]. Ph.D. thesis. Estonian Arts Academy, 2012. 256 p. (In Estonian)
41. **Sander, M.** Field Report, Pärnu maakonna ja linna ning Sindi linna looduskaitsealuste parkide ja puiesteede ülevaade ning puittaimesiku nimestik [The List of Dendrologous Plants of Parks and Avanues Under Nature Protection in Pärnu County and Town and Sindi Town], 1996. (In Estonian)
42. **Sander, H.** Eesti võõrokaspuud 1950. ja 1960. aastatel Aleksei Paiveli käsitluses [Estonian Alien Conifers in 1950s and 1960s by Aleksei Paivel]. *Metsanduslikud uurimused = Forestry studies*, 2006, No. 44, p. 118-144. (In Estonian)
43. **Sander, H.** Võõrpuittaimed Balti kubermangudes (Eestis) 18. sajandi lõpul [Alien Woody Plants in Baltic Governorates (in Estonia) at the end of 18th Century]. *Publicationes instituti Geographici Universitatis Tartuensis*, 2008, No. 105, p. 108−132. (In Estonian)

44. **Sander, H.** Eesti kümme kõige levinumat võõrokaspuud [Ten Most Commonly Spread Alien Coniferous Trees in Estonia]. **In:** Kalender 2009, Tallinn: Olion, 2008, 128−131. (In Estonian)
45. **Sander, H.** Võõrokaspuud 19. sajandi Eestis [Introduced Conifers in Parks in the 19th Century]. ***In:*** *Park on paradiis looduses ja kunstis [Park Is Paradise in Art and Nature].* Tartu: Estonian University of Life Sciences, 2009, p. 198-215. (In Estonian)
46. **Sander, H., Meikar, T.** Eksootilised okaspuud Eesti metsakultuurides [Exotic Conifers in Estonian Forest Plantations]. *Metsanduslikud uurimused = Forestry studies, 2004, No. 40,* p. 41-64. (In Estonian)
47. **Sander, H., Meikar, T.** Exotic Coniferous Trees in Estonian Forestry After 1918. *Allgemeine Forst-und Jagdzeitung*, 2009, No. 180, p. 158−169.
48. **Sander, H., Läänelaid, A.** The Dunkeld larch (Larix × marschlinsii Coaz) in Estonia. *Dendrobiology*, 2007, 57(1), p. 73−80.
49. **Sander, H., Paal, T., Meikar, T., Läänelaid, A., Abner, O., Elliku, J.** Eesti pargid maastiku ja taimestiku liigirikkuse mitmekesistajatena [Estonian Parks As the Diversifiers of Landscape and Species Richness]. ***In:*** *Kaasaegse ökoloogia probleemid: Eesti ökoloogia globaliseeruvas maailmas: Eesti IX ökoloogiakonverentsi lühiartiklid [Problems of Contemporary Economy: Estonian Economics in the Globalizing World: Short Articles of Estonian IX Ecology Conference].* Tartu: Teadusühing "IM SAARE", 2003, p. 294−302. (In Estonian)
50. **Sander, H., Abner, O., Elliku, J., Roht, U.** Võõrpuittaimede liigirikkus Eestis [Species Richness of Alien Woody Plants in Estonia]. ***In:*** *Kaasaegse ökoloogia probleemid. Loodushoiu majandushoovad [The Problems of Contemporary Ecology. Economic Currents of Nature Conservation].* Tartu: Teadusühing IM SAARE, 2006, p. 183-189. (In Estonian).
51. **Sander, H., Elliku, J., Roht, U.** Levinumate võõrokaspuude introduktsioon ja metsistumine Eestis [The Introduction and Running Wild of the Most Common Alien Conifers in Estonia]. ***In:*** *ELUS-i Aastaraamat.* Tallinn: TA kirjastus, 2006, p. 159-184. (In Estonian).
52. **Sander, H., Elliku, J., Roht, U.** Eesti parkide ja kollektsioonide levinumate võõrlehtpuude ja-põõsaste introduktsioonist ja metsistumisest [About the Introduction and Turning Wild of Most Common Alien Deciduous Trees and Shrubs in Estonian Parks and Collections]. ***In:*** *Eesti Looduseuurijate Seltsi aastaraamat*. Tartu: Eesti Looduseuurijate Selts, 2008, p. 78−102. (In Estonian)
53. **Sander, H., Elliku, J.** Parkide võõramaised puittaimed [Alien Woodi Plants in Parks]. ***In:*** *Järvamaa. loodus, aeg, inimene.* Jyväskylä: Gummerus Printing, 2007, p. 158−171. (In Estonian).
54. **Paivel, A., Sander, H.** Eesti liigirikkamate kollektsioonide puittaimed aastatel 1954-1968 [Woody Plants of Estonian Collections Rich in Species in 1954-1968]. ***In:*** *Eesti dendrofloora uuringud [Researches of Woody Plants of Estonia],* VIII, 2004, p. 54−93. (In Estonian)
55. **Kanger, M., Sander, H.** Kodu-ja võõramaiste puittaimede ülevaade Eduard Viiroki poolt aastatel 1926-1936 kogutud materjali alusel [Overview of Indigenous and Alien Woody Plants Based on Materials Collected by Eduard Viirok in 1926-1936]. ***In:*** *Eesti dendrofloora uuringud [Researches of Woody Plants of Estonia],* VIII, 2004 p. 5−53 (In Estonian)
56. **Kull, K.** Võõras ja oma pargis [Foreign and Native in a Park]. ***In:*** *Park on paradiis looduses ja kunstis [Park Is Paradise in Art and Nature].* Tartu: Estonian University of Life Sciences, 2009. p. 342-351. (In Estonian)
57. **Maiste, J.** *Eesti mõisad [Manorial Architecture in Estonia].* Tallinn: Kunst, 1996, 456 p. (In Estonian)
58. **Maiste, J.** *101 Eesti mõisa [101 Estonian Manors].* Tallinn: Varrak, 2014, 216 p. (In Estonian)
59. **Hein, A.** *Palmse/Palms. Ein Herrenhof in Estland [Palmse. A Manor House in Estonia]*. Tallinn: Hattorpe, Eesti Entslükopeediakirjastus, 1996, 239 p. (In Estonian)
60. **Hein A.** *Hüljatud mõisad [Ghost Manors of Estonia].* Tallinn: Hattorpe, 1996, 199 p. (In Estonian)
61. **Hein, A.** Eesti mõisad - 250 fotot aastaist 1860-1939 [Estonian Manors – 250 Photos in 1860-1939]. Tallinn: Tänapäev, 2003, 271 p. (In Estonian)
62. **Hein, A.** Eesti mõisaarhitektuur historitsismist juugendini [Estonian Manor Architecture from Historicism to Art Nouveau]. Tallinn: Hattorpe, 2003, 374 p. (In Estonian)
63. **Rosenberg, T.** *Eesti mõisad [Estonian Manors].* Tallinn: Olion, 1994, 304 p. (In Estonian)
64. **Sinijärv, U.** Pargid kaitsealuste objektidena [Parks as Objects of Protection]. ***In:*** *Parkide restaureerimine [Restoration of Parks].* Tartu College of Tallinn University of Technology, Tartu, Estonia, 2008, p. 179-182. (In Estonian)
65. **Abner, O., Konsa, S., Lootus, K.,** et. al. *Eesti pargid I [Estonian Parks I].* Tallinn: Keskkonnaministeerium, Muinsuskaitseamet, 2007, 400 p. (In Estonian)
66. **Abner, O., Konsa, S., Lootus, K.,** et. al. *Eesti pargid II [Estonian Parks II].* Tallinn: Keskkonnaministeerium, Muinsuskaitseamet, 2012, 400 p. (In Estonian)
67. **Palm, P.** Eesti looduskaitsealuste parkide puittaimestik 19.-20. sajandil [Woody Plants in Estonian Parks Under Nature Protection from 19th to 20th Centuries]. Master Thesis. Estonian University of Life Sciences, 2009. 85 p. (In Estonian)
68. **Palm, P.** Eesti looduskaitsealuste parkide puittaimestik 19.-21. sajandil. Soovituslik nimekiri liikidest, mida kasutada ajalooliste parkide restaureerimisel [Woody Plants in Estonian parks Under Nature Protection in the 19th – 21th Century. A List of Recommended Plant Species for Restored Historical Parks]. *Acta Architecturae Naturalis*, 2013, No. 1, p. 57-72. (In Estonian)
69. **Uhrin, P., Supuka, J.** Quality Assessment of Urban Trees Using Growth Visual and Chlorophyll Fluorescence Indicators. *Ekologia*, 2016, No. 35(2), p. 160-172.
70. **Sulieman, H. M., Mohammed, M. H.** 2014. Patterns of Woody Plant Species Composition and Diversity in Dinder National Park, Sudan. *University of Kordofan Journal of Natural Resources and Environmental Studies*, 2014, No. 1(1), p. 26-36.

71. **Yong, W., Xu Jie, X., Gang, Y., Zhenghuan, W.** The Composition of Common Woody Plant Species and Their Influence on Bird Communities in Urban Green Areas. *Biodiversity Science*, 2014, No. 22(2), p. 196-207.
72. **Šantrůčková, M.** The Topographical Changes Created by the Landscape Design Activities. Case Study of the Czernin Parks, Bohemia. *Acta Universitatis Carolinae. Geographica. Univerzita Karlova*, 2016, No. 51(1), p. 61-71.
73. **The Florence Charter**. International Charter for the Historic Gardens, adopted by the ICOMOS-IFLA Committee for Historic Gardens, meeting in Florence 1981. Addendum to the Venice Charter [online 09.09.2016.]. http://www.icomos.org/charters/gardens_e.pdf
74. **Abner, O., Elliku, J., Paivel, A., Sander, H.** Eesti puittaimede kollektsioonid [Collections of Woody Plants in Estonia.] ***In:*** *Dendroloogilised uurimused Eestis III [Dendrological Studies in Estonia. Part III].* Tallinn, 2002, p. 74–103. (In Estonian)
75. **Elliku, S.** Field Report Virumaa võõramaiste puittaimede kommenteeritud nimestik [The commented list of introduced species in Virumaa county], 1996. (In Estonian)
76. **Elliku, J., Paivel, A., Sander, H.** Dendroflora of arboreta and parks protected by the Nature Conservation Act in Saaremaa (1952-1996), 1997. Tallinn.
77. **Sander, M.** Field Report, Pärnu maakonna ja linna ning Sindi linna looduskaitsealuste parkide ja puiesteede ülevaade ning puittaimesiku nimestik [The list of woody plants of parks and alleys protected by the Nature Conservation Act in Pärnu town and county and town of Sindi], 1996. (In Estonian)
78. **Aaspõllu, A.** 1984. Mõisaparkide inventeerimismaterjalid rajoonide kaupa [The Inventory Materials of Manor Parks by Counties]. Eesti Metsanduse ja Looduskaitse Teadusliku Uurimise Instituut [Estonian Institute of Forestry and Environmental Protection Research]. Spetsiaalne Konstrueerimisbüroo [Special Construction Bureau], ENSV Metsanduse ja Looduskaitse Ministeerium [Ministry of Forestry and Environmental Protection of Soviet Estonia]. (In Estonian)

AUTHORS:
Nele Nutt, PhD, senior lecturer and researcher at Tartu collage, School of Engineering, Tallinn University of Tehnology, Puiestee 78, Tartu 51008, Estonia; nele.nutt@taltech.ee, ph. +372 620 4800
Ardo Kubjas, PhD student at Tartu collage, School of Engineering, Tallinn University of Tehnology, Puiestee 78, Tartu 51008, Estonia; E−mail: ardo.kubjas@taltech.ee

Kopsavilkums. Raksta mērķis izstrādāt metodisko pamatu vēsturisko muižu parku atjaunošanai atbilstoši Florences hartas prasībām. Tāpēc parks netiek pētīts kā objekts no bioloģiskās daudzveidības puses, bet gan kā būvēts piemineklis un arhitektūras elements, kurā sastāvu galvenokārt veido kokaugi. Pētījumā izvērtētas koku un krūmu sugas, kuras sākotnēji izmantotas muižu parkos. Rakstā apkopoti respondentu rezultāti, kas ietver lielāko pētījuma daļu, kurā tiek pētīti Igaunijas muižu galvenie raksturlielumi un parki.

DOI: 10.22616/j.landarchart.2020.17.04

Links between heritage building, historic urban landscape and sustainable development: systematic approach

Indre Grazuleviciute-Vileniske[1], Lina Seduikyte[1], Aurelija Daugelaite[1], Kastytis Rudokas[2]
[1]*Kaunas University of Technology, Faculty of Civil Engineering and Architecture,*
[2]*Kaunas University of Technology, Institute of Architecture and Construction*

Abstract. Heritage and historic buildings deserve attention not only as a significant part of the building stock or from energy efficiency or carbon emissions points of view. They constitute and shape historic urban landscapes that are an integral part of sustainable urban development and sustainable development in a broader sense of humanity in general. However, the sustainable links between the heritage building and historic urban landscape are not well analyzed yet. Meanwhile, the idea that heritage should be a driver of sustainable urban development is more and more explicitly expressed and the concept of historic urban landscape is considered favorable in this regard. The aim of this research was to formulate the theoretical model demonstrating the links between the heritage building, historic urban landscape and sustainable development that would be applied in policy making and planning for heritage driven sustainable urban development. The methods of research included literature review, analysis and synthesis. In order to reach this aim, the analysis of literature on sustainability of cultural heritage, especially heritage buildings was carried out, the concept of historic urban landscape and its implications for sustainability were analyzed and the Halstar approach [29]. based on the systems model adding the dimensions of time and scale to sustainability model developed by the English engineering firm Halcrow was elaborated in the context of heritage buildings and historic urban landscape. The result of the research is the model of the links between heritage building, historic urban landscape and sustainable development, which could be applied in urban development policy design and planning.

Keywords: sustainability, historic urban landscape, heritage building

Introduction

Historic urban landscape is a new attitude towards the management of historic cities and, according to its definition, encompasses not only physical structure, but all the multilayered interaction of natural and man-made, tangible and intangible features [36]. It is even noted that historic urban landscape concept sets a new global standard for urban conservation [17]. Due to its' integrating character the concept of historic urban landscape in the context of sustainability attains the increasing attention; however, as this concept is quite broad and all encompassing, the sustainable links between the historic building and historic urban landscape in the context of sustainability are not well analyzed yet. However, understanding these links is very important in order to implement so-called "heritage-led urban changes" [51], where heritage and historic urban landscape as a whole, usually with inherent characteristics of sustainability [8], can become a driver for further urban development.

The aim of the research was to formulate the theoretical model demonstrating the links between the heritage buildings, historic urban landscape and sustainable development. The methods of research include literature review, analysis and synthesis. In order to reach this aim, the analysis of literature on sustainability of cultural heritage, especially heritage buildings and the notions of sustainable treatment of heritage buildings was carried out, the concept of historic urban landscape and its implications for sustainability were analyzed and the Halstar approach [29] based on the systems model adding the dimensions of time and scale to sustainability model developed by the English engineering firm Halcrow was elaborated in the context of heritage buildings and historic urban landscape. Historic urban landscape here is demonstrated as the interaction of five capitals – natural, sociocultural, human, manufactured, and financial. While elaborating the potential influence of heritage building on each type of capital the intangible dimension was given a special attention, as it is very important in heritage context and often ignored in sustainability discourse.

Theory

Cultural heritage and sustainability. Cultural heritage, including heritage buildings and their preservation, in the context of sustainability is quite well analysed topic with numerous publications. Heritage buildings can considered the "buildings that are significant in the history of

architecture, that incorporate significant architectural features, or that played significant historic roles in local cultural or social development; may or may not be officially designated" [2]. Some publications reveal general benefits of heritage buildings and urban environment and their preservation to the sustainability dimensions [45], numerous studies are targeted at so-called sustainable restoration or sustainable preservation [23; 30; 24; 3], others are dedicated to decision-making and policies [27].

Heritage and dimensions of sustainability. According Magrini and Franco (2016), the concept of sustainability in heritage field refers to „a very broad horizon, touching various spheres: cultural, economic, social, environmental, before the purely technical and energetic ones." For example, Tweed and Sutherland (2007) had analysed the extent to which built heritage is embraced by evolving concept of sustainability and how built heritage contributes to the satisfaction of individual needs and the needs of society. They had distinguished the environmental dimension, mainly focusing on the effects of pollution on buildings, the economic dimension including urban regeneration, tourism and resulting positive economic impact, the social dimension including cultural identity and transfer of the cultural capital to future generations. Some researchers devote attention to the particular spheres of sustainability and the role of cultural heritage in them [14]. For example, Greffe (2004) analysed heritage's economic dimension through job creation. Separate aspects, such as heritage buildings and energy [24; 44; 22] are widely considered as well. Other researches distinguish specific aspects characteristic to cultural heritage in the context of sustainability. For example, Vecco (2020) had analyzed the spirit of place (*genius loci*) phenomenon undoubtedly linked with heritage in the context of sustainability. The understanding of this issue is constantly expanding and the idea of sustainable development, especially in heritage field, does not revolve solely around carbon emissions anymore as it is well exemplified by the study of Vecco (2020). Currently the regenerative attitude towards heritage and sustainability is developed [4] within the context of restorative and regenerative movements in sustainability field with reference to regeneration as the feature of natural systems. The authors of regenerative approach to heritage [21] identify its contributions to sustainability in the spheres of education, resources, carbon reduction, well-being, water, equity, energy and place-making; according to them, "the final output of regenerative heritage approach should be the creation of a space that is able to revitalize the surroundings and the context where it is placed".

James et al. (2014) provided a more comprehensive view the of the future of sustainable development within the fields of heritage and preservation of natural resources. According to them, so many features of contemporary approach of sustainability rely on sustainability of "negation", which is negative due to its conformity with the harmful basis of present day activities instead of creating a new sustainable future. Thus lowering carbon emissions can be seen as simulated attempts to implement sustainability. Instead of this "negation" sustainability, that James et al. (2014) call "preservation of the present", they introduce the conservation-based approach that relies on conserving the patterns of living past and present that are sustainable by their very nature. Thus heritage here is perceived as making impact to the larger scale of sustainable future, since it is intended to conserve not only material outcomes that derived from culture of particular times and societies, but rather merge all sustainable practices and outcomes of these practices in order to create the sustainability of the future. This approach correlates with the "living heritage" theory provided by Pollious (2014), Wijasuriya (2005) and the theory of narrative of heritage by Walter (2014) and Rudokas (2017) that are based on the premise that not necessarily the actual artifact needs to be transmitted from the past to the future, but rather it is necessary to find the inherited way to transmit the creative potential that caused the construction of any heritage property. Indeed latter highly theoretic approaches offer little practical solution for the implementation of sustainability; however, they emphasize the need for revelation of creativity that is contained within the patterns of complex problem solving in the past.

Sustainable conservation, restoration, renovation and management. Magrini and Franco (2016) identify sustainable process of conservation, renovation, reuse and management of historical architecture. Blundo et al. (2018) use the term sustainable restoration. Bertolin and Loli (2018) identify sustainable interventions in heritage buildings. According to Zeayter and Mansour (2018), "the sustainable development of cultural values is achieved by making the conserved area: accessible, useful and integral to the daily life of local inhabitants. The objectives of the sustainable approach in conservation depend on public participation and community involvement". Perhavec et al. (2015) underline that sustainable conservation and renovation require holistic and interdisciplinary approach, cooperation between experts and the use of modern computer-based instruments, appliances and tools. Term sustainability is used in heritage context evaluating heritage restoration and retrofitting

projects including the integration of new engineering systems and their effect of heritage's authentic character; for example, Maahsen-Milan and Fabbri (2013). Zvonko (2016) analyzed policy incentives for refurbishment and energy efficiency of heritage buildings in Europe, the USA, Canada and New Zealand. The achievements of sustainable conservation, restoration, renovation and management efforts are usually exemplified by the case studies, for example Rodwell (2007), distinguishing specific regions and situations, including costal heritage [5; 16]. Callegari (2003) identifies cultural heritage as a positive force in the implementation of integrated Italian coastal management programs. Howard and Pinder (2003) analyze the experiences in South West England showing cultural heritage as a potential resource and its implications on the development of local economy and environment. These case studies reveal, that so-called sustainable treatment of heritage objects has wider social, cultural, and economic effects and sustainability of cultural heritage is not limited with the building or complex of several buildings. It can be further developed that architectural heritage can be seen as an active agent for more sustainable place making. In the case study regarding the impact of cultural heritage to the residential real estate pricing in Kaunas (Lithuania) [39] it has been found the heritage status does not do much impact to the real estate prices; whereas belonging to the heritage preservation area adds extra 5 percent to the price of the real estate unit. These numbers are low compared with the experience of the Western European towns and cities. However the second outcome of the study indicated that heritage preservation area might cause the better overall quality of new architecture (built between 2015-2019) within that territory and in the territories nearby. Therefore, built heritage, due the legislative system and its status in public, plays a crucial role contributing to the overall quality of environment by positively influencing the development of new architecture.

International legal framework. It can be noted that cultural heritage plays a marginal role in the 2030 Agenda for Sustainable Development and is explicitly mentioned only once in the goal 11, that refers to the cities: "Strengthen efforts to protect and safeguard the world's cultural and natural heritage" [42; 47]. According to Vecco and Srakar (2018), even this mentioning can be seen as weak as it does not specifically refer just to cultural heritage but also environmental protection without the reference to heritage valorisation or regeneration. Nevertheless, serious attempts are made by the United Nations demonstrating the role of heritage and its integration in sustainable development processes. It is a necessary reaction against the threats of development in various aspects on heritage and its inherent values [25]. The United Nations Policy Document for the Integration of a Sustainable Development Perspective into the Processes of the World Heritage Convention (2015) recognizes and promotes the inherent potential of heritage property to contribute to all dimensions of sustainable development. While the policy is specifically aimed at the World Heritage properties, its principles are relevant to cultural and natural heritage in general. The following aspects of sustainability related with heritage properties are identified in this document: preservation of biodiversity, enhancement of sustainable livelihoods, inclusive local economic development and economic resilience, economic diversification, strengthening social resilience, use of local resources and skills, preservation of local knowledge systems and infrastructures, capacity building, innovation and local entrepreneurship [33]. The New Urban Agenda adopted at the United Nations Conference on Housing and Sustainable Urban Development in Quito, Ecuador on 20 October 2016 recognizes cultural heritage as an important factor for urban sustainability [26; 27] as well.

The analysis of cultural heritage in the context of sustainability reveals the integration trend: cultural heritage related processes can be seen as a part of overall sustainable development of societies and the effects of sustainable treatment of heritage buildings can be felt on much wider scale. These links encourage viewing the historic urban landscape in the context of sustainability and analyzing the role and links of heritage buildings in it.

Historic urban landscape and sustainability

The concept of regenerative heritage [21] and the view expressed in the international documents and demonstrated by heritage sustainability studies that cultural heritage can contribute to wider urban sustainability encourages to consider the concept of historic urban landscape in the context of sustainability. The official definition of the historic urban landscape was presented in 2005 in Vienna Memorandum World Heritage and Contemporary Architecture - Managing the Historic Urban Landscape and then further elaborated in the UNESCO Recommendation on the Historic Urban Landscape (2011): "The historic urban landscape is the urban area understood as the result of a historic layering of cultural and natural values and attributes, extending beyond the notion of "historic centre" or "ensemble" to include the broader urban context and its geographical setting. This wider context includes notably the site's topography, geomorphology, hydrology and natural features, its built environment, both historic and contemporary, its infrastructures above and below ground, its open spaces and gardens, its land use patterns and spatial

organization, perceptions and visual relationships, as well as all other elements of the urban structure. It also includes social and cultural practices and values, economic processes and the intangible dimensions of heritage as related to diversity and identity." According the document, the identification, assessment, conservation and management of historic urban landscapes should take place within an overall sustainable development framework and identify their potential contribution to sustainability in such spheres as economic development and diversity, services and tourism, balance between urban growth and quality of life, productive and efficient use of public spaces, sense of place, preservation of existing resources, social cohesion, social and functional diversity, identity of communities, creativity, enhancing liveability of urban areas, well-being of communities, new models of urban living [36]. The researchers underline the innovativeness of historic urban landscape approach naming it as both an approach and a new understanding of the historic environment [10], "a new global standard for urban conservation", which seeks to include both the tangible and intangible dimensions of urban heritage [17]; as "the paradigm of the management of thoughtful change" [19].

Historic urban landscape is rather new topic in scientific research, bearing in mind that the concept itself is quite recent. The number of research publications on this topic has increased only in the recent years. The literature review by Ginzarly et al. (2019) revealed the shift of concerns in this area in the period between 2016 and 2018, were term sustainable emerges more often. Some publications regarding historic urban landscape and sustainability can be mentioned including Erkan (2018), Onesti (2018), Santander (2018), Zeayter and Mansour (2018), Wang and Gu (2020). For example, Zeayter and Mansour (2018) analyze the benefits of historic urban landscape approach in the context of other heritage preservation trends. They analyze different heritage preservation trends according to three factors: selectivity, authenticity / integrity, and sustainability and identify the historic urban landscape approach as "optimum ideology". Dhingra et al. (2017) note that old and historic settlements have inherent sustainability features, such as compactness, walkability, energy efficiency and social cohesiveness, which in some instances were lost or damaged in the course of time. According to Wang and Gu (2020), historic urban landscape approach contributes to contemporary urban sustainability. Researchers mention the integrative character of the concept in the frame of sustainability and urban planning discussion [9; 51]. For example, Wang and Gu (2020) note that "the historic urban landscape approach embodying both integrative and morphological values is fundamental to the formulation of historically-sensitive and community-based urban development and conservation plans."

According to the guidebook, issued by UNESCO, the historic urban landscape approach is being successfully applied in a number of cities around the world [43], this is reflected in some recently published research. For example, Rey-Perez and Avila (2017) present a methodology developed on the basis of the historic urban landscape notion applied for the city of Cuenca in Ecuador and formulate the series of sustainable urban development strategies. Their methodology is based on the city analysis from the local community and multiple disciplines (geomorphology, environment, urban planning, historic cartography, architecture, archaeology, anthropology, and economy) points of view. Wang and Gu (2020) present the analysis of Pingyao as one of the first urban World Heritage Sites in China in the light of application of Historic Urban Landscape approach. Dhingra et al. (2017) present the study of historic urban landscape characterization using the case of the walled city of Alwar in the state of Rajasthan (India). The study identified the core of historic urban landscape and the GIS were used to map characteristics of its old neighborhoods, commercial areas, road network, open spaces and intangible heritage. According to Santander (2018), at the theoretical level the notion of historic urban landscapes and its potential contribution to sustainability do not raise questions; however, the complexity of the notion makes challenging its application in actual heritage and urban environment management processes. Thus in order to successfully apply the concept of historic urban landscapes, where heritage would become the engine for the development of both historic environments and the entire urban territory [51], the framework for the analysis of historic urban landscape, heritage building and sustainability links is necessary.

Sustainability models

Sustainable development is "subjective and value laden, open to interpretation and achieving it involves balancing a complex system of issues" [29]. Thus for the construction of the model, the appropriate representation of sustainability dimensions and their links must be selected. The majority of sustainability models are based on the basic Brundtland definition with the three main themes – economy, environment and society. However, culture is distinguished as the fourth dimension or pillar of sustainability increasingly often in the recent decades [7]. The United Nations Policy Document for the Integration of a Sustainable Development

Perspective into the Processes of the World Heritage Convention (2015) identifies environmental sustainability, inclusive social development, and inclusive economic development, as well as the fostering of peace and security as the dimensions of sustainability. Lozzano (2008) identified three most common graphical models of sustainability: three circles that inter-connect, where the resulting overlap represents sustainability, three concentric circles, the inner circle representing economic aspects, the middle social aspects, and the outer environmental aspects, and the planning hexagon, showing the relationships among economy, environment, the individual, group norms, technical skills, and legal and planning systems. The English engineering firm Halcrow elaborated the Halstar approach based on a systems model that adds the dimensions of time and scale to sustainability model [29; 41]. The importance of time and scale is that it describes the dynamic nature of urbanism. Change is constant in urban environment and historic urban landscapes are not exception and the impacts of changes can be interpreted very differently if viewed in short-term or long-term scales and in different levels of influence [41].

Results: heritage building in the context of sustainable development of historic urban landscape

Heritage conservation literature supports the idea that historic urban conservation needs to be a coherent and integrated part in the processes of socio-economic development, regional and urban planning [38; 25] and the preservation of individual heritage building should be integrated into the management of its context environment. Moreover, as it was mentioned in the previous sections, heritage can become a driver for sustainable development as well. These multi-level heritage preservation and management efforts should take place within an overall sustainable development framework. In order to understand these processes more clearly, the model of the links between heritage building, historic urban landscape and sustainable development was constructed.

Taking into consideration the importance of time and scale in sustainability in heritage context, the Halstar approach [29] was selected for development of the model for this research. The model below (Fig. 1), based on this approach, demonstrates sustainability as the interaction of natural, sociocultural, human, manufactured and financial capitals in the scale from the user to the global level and in the short, medium and long terms. In the vertical column to the right it is visible that historic urban landscape is the interaction of all five above-mentioned capitals and the inseparable context and determinant of heritage buildings in the urban environment; moreover, the pie chart demonstrates that heritage buildings can contribute to the enhancement of these five types of capital in different scales and time-frames.

In the pie-chart (Fig. 1) the segments attributed to five capitals demonstrate the potential contribution of heritage building towards sustainable development of society and historic urban landscape. These potential contributions were identified based on above analyzed international documents [48; 36; 33]. The vertical column to the right demonstrates the components and features of historic urban landscape [48; 36]. Such categorization helps to identify better the contribution of heritage buildings both to overall sustainability and sustainable development of historic urban landscapes.

Natural capital. The natural capital features of historical urban landscape constitute of topography, geomorphology, hydrology, and natural features [48]; in the context of natural capital sustainable conservation, restoration, renovation, re-use and management of heritage buildings can contribute to preservation of biodiversity, preservation of existing resources, embodied energy and unbuilt natural or agricultural land [33].

Human capital. Perceptions and visual relationships are the features of historic urban landscape identified in the documents [48] that could be related to human dimension in the Halstar model. These features can be maintained and enhanced through sustainable and precautious treatment of heritage buildings. Moreover, sustainable heritage conservation, restoration, renovation, re-use and management can enhance other aspects of human capital including creativity, use of local skills, capacity building, entrepreneurship [33].

Sociocultural capital. The original Halstar model includes social capital [29], however, in this research it was extended to sociocultural capital based on the importance of cultural dimension in sustainability [7] and in historic urban landscapes. The features of historic urban landscape that could be attributed to this dimension of capital include social and cultural practices and values, diversity, identity, and intangible dimensions [48]. Sustainable practices targeted at heritage buildings could contribute to social (social resilience, social cohesion, social diversity, liveability of urban areas), economic (well-being of communities, inclusive local economic development), and cultural (preservation of local knowledge systems, identity of communities, sense of place) spheres. For example, culture-led regeneration strategies that reuse heritage buildings and engage with local citizens, can reinforce local culture and community's sense of pride and local identity [43]. It is necessary to note the intangible dimensions of historic urban

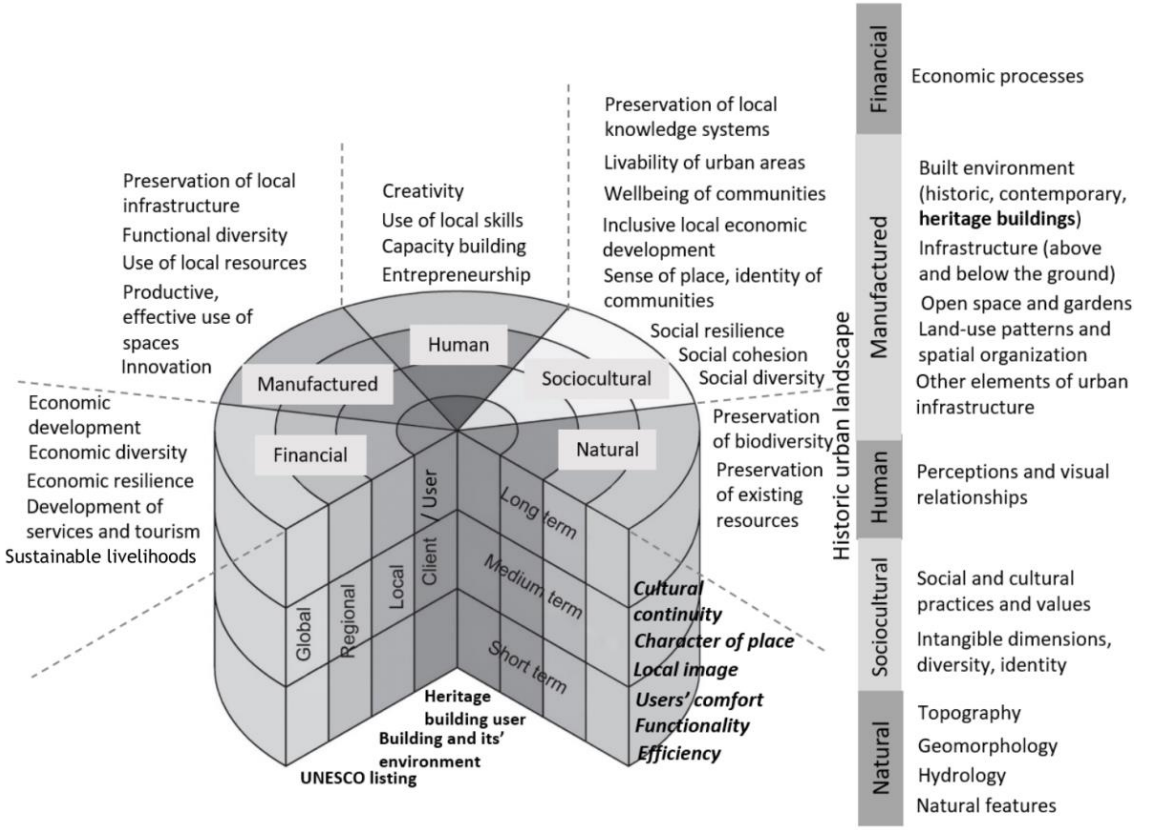


Fig. 1. Model, demonstrating the links between heritage building, historic urban landscape and sustainable development based on Halstar approach [48; 29; 33]

landscape. According to Graham et al. (2000), "heritage is inherently a spatial phenomenon. All heritage occurs somewhere". However, not only spatial aspects, but also intangible ones' matter for sustainable development. The idea of Grant (2010), that only moving for tangible to intangible, from material to less material and more spiritual forms of consumption would allow humanity to reach sustainability, could matter in this context. Vecco (2020) had considered tangible and intangible aspects of locality in sustainability concept. This intangible dimension and its nexus with tangible world could be identified as a spirit of place (genius loci) [46; 31], symbolic potential, mythical-symbolic essence of the architectural environment [32]. According to Vecco (2020), *genius loci* „has a double character of tangibility and intangibility", „is a multidimensional and 'multi-value' asset, in the sense that it can belong to numerous dimensions of different significance (economic, social, cultural, etc.) in which it receives different values". According to Ginzarly (2019a), the historic urban landscape is the complex layering of cultural and natural values and attributes that contribute to the identity and sense of a place, or *genius loci*. This reveals its importance in sustainability context, nevertheless this asset nowadays if often ignored [31]. Vecco (2020) proposed the three-fold process: rethink, protect and transmit the place and its spirit. According to her, this „threefold movement is not linear. To be successful it needs to be circular and incremental". According to Petrušonis (2018) „to maintain the identity of system, it is necessary to take into account the system history (memory). In other words, we have to respect historical determinants of genius loci" and the role of heritage buildings cannot be underestimated in this context.

Manufactured capital. The constituent parts of historic urban landscape that can be at least partially associated with the dimension of manufactured capital in the model are the built environment, both historic and contemporary including heritage buildings, infrastructure, open spaces and gardens, land-use patterns and spatial organization etc. Sustainable practices targeted at heritage buildings can contribute to preservation of local infrastructure, functional diversity, use of local resources, productive, effective use of spaces, and innovation [48; 33].

Financial capital. The constituent feature of historic urban landscape identified in the documents [48] that can be linked with financial capital are the economic processes. Sustainable heritage conservation, restoration, renovation, re-use and management can positively contribute economic development, economic diversity, economic resilience, development of services and tourism, sustainable livelihoods. According to Onesti (2018), the actions on heritage and landscape can even contribute to the implementation of circular economy model as it is "closely interdependent with

the regeneration of landscape, which produces value through maintenance, recovery, reuse, restoration <…> and contributes to the quality of landscape enhancing the density of relations, symbioses, and synergies that multiply the flow of benefits in a virtuous loop" [28].

The vertical segments of the pie chart demonstrate the levels of consideration and influence of heritage building. The approach using the levels of influence is known in the building sustainability assessment, for example, Cole (1999) distinguished such levels of influence or scale in the building sustainability assessment: building materials, building components, building itself, community, region, global scale. Different scales are distinguished in heritage theory and practice as well. Graham et al. (2000) distinguish local, national, continental and global scales in heritage analysis. Harvey (2015) identifies the following diversity of scales in heritage articulation: „individuals and communities, towns and cities, regions, nations, continents or global" and notices the phenomena of „downscaling" (concentrating on community, family, individual levels) and „upscaling" (focusing on the universal understanding) phenomena in heritage treatment. This shows the importance of scale in heritage and sustainability discourse and analysis. The Policy Document for the Integration of a Sustainable Development Perspective into the Processes of the World Heritage Convention underlines that achieving sustainable development will require acting at a scale that is much larger than the heritage property itself [33]. Halstar model [29] includes levels from client or user, to local, regional and global. In heritage building and historic urban landscape these levels can include but are not limited: the users of heritage building or historic environment, building and its environment, neighborhood, city, region, national, and even global levels. The consideration of levels is important in order to avoid the above mentioned downscaling or upscaling effects.

The horizontal segments of the pie chart demonstrate the time scale of the potential effects of the intervention in heritage building in different time frames: short-term (for example, users' comfort, functionality, and efficiency after the implementation of the project), medium-term (for example, the image of the place developing in several decades), and long-term (character of place, cultural continuity). The long-term effects and sustainability of the intervention into heritage object or landscape is a concern of Vienna Memorandum (2005). One of the provisions of Policy Document for the Integration of a Sustainable Development Perspective into the Processes of the World Heritage Convention is applying a long-term perspective to all processes of decision-making [33].

The framework elaborated in this research demonstrating the links between the historic urban landscape, heritage building and sustainability can be applied in urban development policy design and planning. This would allow cultural heritage, including heritage buildings and historic environment in general, to function as the driver, the leading factor for sustainable development of urban areas.

Conclusions

It is evident that the effects of sustainable treatment of heritage buildings can be felt on much wider scale including the entire urban landscapes with their tangible and intangible layers. In order to understand better the role of cultural heritage, including heritage buildings, in the sustainable development of urban areas, the notion of historic urban landscape presented in 2005 in Vienna Memorandum and further elaborated in 2011 in the UNESCO Recommendation on the Historic Urban Landscape was analyzed. The historic urban landscape notion integrating the array of the components and features of landscape from natural to man-made, from tangible to intangible, from historic to contemporary provides the innovative approach for the development of urban areas that would allow continuing the valuable features of historic environment simultaneously with high quality new developments. The valuable features of heritage in this way could become the drivers of wider urban sustainability.

Despite the potential of the notion of historic urban landscape for sustainability, its practical application in urban areas still raises questions. For the better understanding of the links between heritage building, historic urban landscape and sustainability that would allow achieving sustainable urban development driven by heritage, the framework was elaborated based on the Halstar approach. It demonstrates sustainability as the interaction of natural, sociocultural, human, manufactured and financial capitals in the scale from the user to the global level and in the short, medium and long term. It is visible that historic urban landscape is the interaction of all five above-mentioned capitals and the inseparable context and determinant of heritage buildings in the urban environment; moreover, heritage buildings can contribute to the enhancement of these five types of capital in different scales and timeframes. The model could be applied in urban development policy design and planning.

References

1. **Bertolin, Ch., Loli, A.** Sustainable Interventions in Historic Buildings: A Developing Decision Making Tool. *Journal of Cultural Heritage,* 2018, No November–December (34), p. 291–302. https://doi.org/10.1016/j.culher.2018.08.010
2. **Le Blanc, F.** *Heritage Conservation Terminology. Definition of Terms from Various Sources*. 2019. [online 29.12.2020.]. http://ip51.icomos.org/~fleblanc/documents/terminology/doc_terminology_e.html.

3. **Blundo, D. S., Ferrari, A. M., del Hoyo, A. F., Riccardi, M. P., García Mui˜na, F. E.** Improving Sustainable Cultural Heritage Restoration Work Through Life Cycle Assessment Based Model. *Journal of Cultural Heritage,* 2018, No. July-August (32), p. 221–231. https://doi.org/10.1016/j.culher.2018.01.008
4. **Brown, M., Haselsteiner, E., Apró, D., Kopeva, D., Luca, E., Pulkkinen, K., Vula Rizvanolli, B.** *Sustainability, Restorative to Regenerative.* COST Action CA16114 RESTORE, Working Group One Report, Restorative Sustainability, 2018. 120 p.
5. **Callegari, F.** Sustainable Development Prospects for Italian Coastal Cultural Heritage: a Ligurian Case Study. *Journal of Cultural Heritage,* 2003, No. January (4), p. 49–56. DOI: 10.1016/S1296-2074(03)00007–4.
6. **Cole, R. J.** 'GBC' Building Environmental Assessment Methods: Clarifying Intentions, *Building Research & Information,* 1999, No. 4/5(27), p. 230–246.
7. Culture: the Fourth Pillar of Sustainable Development. United Cities and Local Govermenets, 2010. [online 17.10.2020.]. http://www.agenda21culture.net/sites/default/files/files/documents/en/zz_culture4pillarsd_eng.pdf.
8. **Dhingra, M., Singh, M. K., Chattopadhyay, S.** Macro Level Characterization of Historic Urban Landscape: Case Study of Alwar Walled City. *City, Culture and Society*, 2017, No. June (9), p. 39–53.
9. **Erkan Y.** Viewpoint: Historic Urban Landscape Approach for Sustainable Urban Development. *The Historic Environment: Policy & Practice*, 2018, No. 3-4(9), p. 346–348. DOI:10.1080/17567505.2018.1517192
10. **Ginzarly, M., Houbart, C., Teller, J.** The Historic Urban Landscape Approach to Urban Management: a Systematic Review. *International Journal of Heritage Studies*, 2019, No. 10(25), p, 999–1019. DOI:10.1080/13527258.2018.1552615
11. **Ginzarly, M., Roders, A. P., Teller, J.** Mapping Historic Urban Landscape Values Through Social Media. *Journal of Cultural Heritage*, 2019a, No. March-April (36), p. 1–11.
12. **Grant, L. K.** Sustainability: from Excess to Aesthetics. *Behavior and Social Issues,* 2010, No. May (19), Article 7–47. DOI *https://doi.org/10.5210/bsi.v19i0.2789*
13. **Graham, B. J., Ashworth, G. J., Tunbridge, J. E.** A Geography of Heritage: Power, Culture and Economy. London: Arnold, 2000, p. 288.
14. **Greffe, X.** Is Heritage an Asset or a Liability? *Journal of Cultural Heritage*, 2004, No. 3(5), p. 301–309. doi:10.1016/j.culher.2004.05.001
15. **Harvey, D. C.** Heritage and Scale: Settings, Boundaries and Relations. *International Journal of Heritage Studies*, 2015, 6(21), p. 577–593. DOI: 10.1080/13527258.2014.955812
16. **Howard, P., Pinder, D.** Cultural Heritage and Sustainability in the Coastal Zone: Experiences in South West England. *Journal of Cultural Heritage*, 2003, No. 1(4), p. 57–68. DOI:10.1016/S1296-2074(03)00008–6
17. **van der Hoeven, A.** Historic Urban Landscapes on Social Media: The Contributions of Online Narrative Practices to Urban Heritage Conservation. *City, Culture and Society,* 2019, No. June (17), p. 61–68.
18. **James, P., Magee, L., Scerri, A., Steger, M.** Urban Sustainability in Theory and Practice: Circles of Sustainability. London: Routledge, 2014, 282 p.
19. **Khalaf, R. W.** A Proposal to Apply the Historic Urban Landscape Approach to Reconstruction in the World Heritage Context. *The Historic Environment: Policy & Practice*, 2018, 1(9), p. 39–52. DOI: 10.1080/175675 05.2018.1424615
20. **Lozano, R.** Envisioning Sustainability Three-dimensionally. Journal of Cleaner Production, 2008, 17(16) p. 1838–1846. https://doi.org/10.1016/j.jclepro.2008.02.008
21. **Luca, E., Sulc, I., Haselsteiner, E.** Regenerative Heritage. ***In:*** *Sustainability, Restorative to Regenerative,* COST Action CA16114 RESTORE, Working Group One Report Restorative Sustainability, 2018, p. 67–86.
22. **Lidelöw, S., Örn, T., Luciani, A., Rizzo, A.** Energy-efficiency Measures for Heritage Buildings: A Literature Review. Sustainable Cities and Society, 2019, No. February (45), p. 231–242.
23. **Maahsen-Milan, A., Fabbri, K.** Energy Restoration and Retrofitting. Rethinking Restoration Projects by Means of a Reversibility/Sustainability Assessment. *Journal of Cultural Heritage*, 2013, No. 3(14), p. 41–44. http://dx.doi.org/10.1016/j.culher.2012.12.011
24. **Magrini, A., Franco, G.** (2016) The energy performance improvement of historic buildings and their environmental sustainability assessment, *Journal of Cultural Heritage*, Volume 21, p. 834–841. http://dx.doi.org/ 10.1016/j.culher. 2016.03.012
25. **Najd, M. D., Ismail, N. A., Maulan, S., Yunos, M. Y., Niya, M. D.** Visual Preference Dimensions of Historic Urban Areas: The Determinants for Urban Heritage Conservation. Habitat International, No. October (49), p. 115–125. https://doi.org/10.1016/j.habitatint.2015.05.003
26. New Urban Agenda. United Nations Conference on Housing and Sustainable Urban Development (Habitat III), 2016. [online 17.10.2020.]. http://habitat3.org/the-new-urban-agenda/
27. **Nocca, F.** The Role of Cultural Heritage in Sustainable Development: Multidimensional Indicators as Decision-Making Tool. *Sustainability*, 2017, No. 9(10), Article 1882. doi:10.3390/su9101882
28. **Onesti, A., Biancamano, P.F., Bosone, M.** From Tangible to Intangible and Return: Hybrid Tools for Operationalizing Historic urban Landscape Approach. ***In:*** *ICOMOS 19th General Assembly and Scientific Symposium "Heritage and Democracy"*, New Delhi, India, 2018. [online 17.10.2020.]. http://openarchive.icomos.org/1972/
29. **Pearce, O. D. J., Murry, N. J. A., Broyd, T. W.** Halstar: Systems Engineering for Sustainable Development. *Proceedings of the Institution of Civil Engineers - Engineering Sustainability*, 2012, No. 2(165), p. 129–140 https://www.icevirtuallibrary.com/doi/10.1680/ensu.9.00064
30. **Perhavec, D. D., Rebolj, D., Suman, N.** Systematic Approach for Sustainable Conservation. *Journal of Cultural Heritage*, 2015, No.1 (16), p. 81–87. http://dx.doi.org/10.1016/j.culher.2014.01.004
31. **Petrušonis, V.** Symbolic Potential of Place and its Modelling for Management Needs. *Landscape Architecture and Ar*t, 2018, No. 13(13), p. 39–48.

32. **Petrušonis, V.** Conditions for a Dialogue of Local Community and Genius Loci. *Architecture and Urban Planning,* 2018a. No. 1(14), p. 70–74. doi: 10.2478/aup-2018-0009
33. Policy Document for the Integration of a Sustainable Development Perspective into the Processes of the World Heritage Convention as adopted by the General Assembly of States Parties to the World Heritage Convention at its 20th session, 2015. [online 17.10.2020.]. https://whc.unesco.org/en/sustainabledevelopment/
34. **Poulios, I.** *The Past in the Present: a Living Heritage Approach - Meteora, Greece. Ubiquity Press*, 2014, 182 p.
35. Operational Guidelines for the Implementation of the World Heritage Convention, 2007. [online 17.10.2020.]. https://whc.unesco.org/en/guidelines/
36. Recomendation on the Historic Urban Landscape, 2011. [online 17.10.2020.]. https://whc.unesco.org/uploads/activities/documents/activity-638-98.pdf
37. **Rey-Perez, J., Ávila, M. E. S.** Historic Urban Landscape: an Approach for Sustainable Management in Cuenca (Ecuador). *Journal of Cultural Heritage Management and Sustainable Development*, 2017, No. 3(7), p. 308–327. https://doi.org/10.1108/JCHMSD-12-2016-0064
38. **Rodwell, D.** Conservation and Sustainability in Historic Cities. Oxford: Blackwell Publishing Ltd, 2007, p. 272.
39. **Rudokas, K.** *Narrative Concept of Urban and Architectural Heritage of the City*. Ph.D. thesis. Kaunas, Kaunas University of Technology, 2017, p. 118.
40. **Rudokas, K., Landauskas, M., Viliūnienė, O., Gražulevičiūtė-Vileniškė, I.** Hedonic Analysis of Housing Prices and Development in Kaunas: Heritage Aspect. *Environmental Research, Engineering and Management*, 2019, No. 2(75), p. 15–27.
41. **Santander, A. A., Garai-Olaun, A. A., de la Fuente Arana, A.** Historic Urban Landscapes: A Review on Trends and Methodologies in the Urban Context of the 21st Century. *Sustainability*, 2018, 8(10), Article 2603.doi:10.3390/su10082603
42. Sustainable Development Agenda 2030, 2015. [online 17.10.2020.]. https://www.un.org/sustainabledevelopment/development-agenda/
43. The HUL Guidebook. Managing Heritage in Dynamic and Constantly Changing Urban Environments. A Practical Guide to UNESCO's Recommendations on the Historic Urban Landscape, 2016. [online 17.10.2020.]. http://historicurbanlandscape.com/themes/196/userfiles/download/2016/6/7/wirey5prpznidqx.pdf
44. **Todorovic, M. S.** In Search of a Holistic, Sustainable and Replicable Model for Complete Energy Refurbishment in Historic Buildings. *Conservation Science in Cultural Heritage. Historical-Technical Journal*, 2012. [online 20.07.2017.] https://conservation-science.unibo.it/article/view/3381
45. **Tweed, C., Sutherland, M.** Built Cultural Heritage and Sustainable Urban Development. *Landscape and Urban Planning*, 2007, No. 1(83), p. 62–69.
46. **Vecco, M.** Genius Loci as a Meta-Concept. *Journal of Cultural Heritage*, 2020, No. January-February (41), p. 225–231. https://doi.org/10.1016/j.culher.2019.07.001
47. **Vecco, M., Srakar, A.** The Unbearable Sustainability of Cultural Heritage: An Attempt to Create an Index of Cultural Heritage Sustainability in Conflict and War Regions. *Journal of Cultural Heritage*, 2018, No. September-October (33), p. 293–302. https://doi.org/10.1016/j.culher.2018.06.009
48. Vienna Memorandum World Heritage and Contemporary Architecture – Managing the Historic Urban Landscape, 2005. [online 17.10.2020.]. https://unesco.lt/uploads/file/failai_VEIKLA/kultura/RA_Vienna_memorandum.pdf
49. **Walter, N.** From Values to Narrative: a New Foundation for the Conservation of Historic Buildings. *International Journal of Heritage Studies*, 2014, No. 6(20), p. 634–650. doi: *10.1080/13527258.2013.828649*.
50. **Wijesuriya, G.** The Past in the Present: Perspectives in Caring for Buddhist Heritage Sites in Sri Lanka. ***In:*** *Conservation of living religious heritage*. Papers from the ICCROM 2003 forum of living religious heritage: conserving the sacred, ICCROM, Rome, 2005, p. 31–43.
51. **Wang, Sh., Gu, K.** Pingyao: The Historic Urban Landscape and Planning for Heritage-led Urban Changes. *Cities*, 2020, No. February (97), Article 102489. *https://doi.org/10.1016/j.cities.2019.102489*
52. **Zeayter, H., Mansour, A. M. H.** Heritage Conservation Ideologies Analysis – Historic Urban Landscape Approach for a Mediterranean Historic City Case Study. HBRC Journal, 2018, No. 3(14), p. 345–356. https://doi.org/10.1016/j.hbrcj.2017.06.001

AUTHORS:
Indre Grazuleviciute-Vileniske; dr.; associated professor; Kaunas University of Technology, Faculty of Civil Engineering and Architecture, Studentu st. 48, LT-51367 Kaunas, Lithuania; E−mail: indre.grazuleviciute@ktu.lt
Lina Seduikyte; dr.; associated professor; Kaunas University of Technology, Faculty of Civil Engineering and Architecture, Studentu st. 48, LT-51367 Kaunas, Lithuania; E−mail: lina.seduikyte@ktu.lt
Aurelija Daugelaite; PdD student; Kaunas University of Technology, Faculty of Civil Engineering and Architecture, Studentu st. 48, LT-51367 Kaunas, Lithuania; E−mail: aurelijai@gmail.com
Kastytis Rudokas; dr.; researcher; Kaunas University of Technology, Institute of Architecture and Construction, Tunelio St. 60, LT-44405 Kaunas, Lithuania, E−mail: kastytis.rudokas@ktu.lt

Kopsavilkums. Pētījumā izmantotās metodes ietver literatūras apskatu, analīzi un sintēzi. Literatūras izpēte veikta kultūras mantojumam, mantojuma ēkām, ilgtspējas pamaprincipiem, vēsturiskās pilsētvides ainavas koncepcijai un tās ietekmei uz attīstību. Rezultātā iegūts mantojuma veidošanas, vēsturiskās pilsētvides un ilgtspējīgas attīstības modelis, kuru iespējams izmantot pilsētu attīstības politikas veidošanā un plānošanā.

DOI: 10.22616/j.landarchart.2020.17.05

Inspirative Geology - the Influence of Natural Geological Formations and Patterns on Contemporary Landscape Design

Nawarah Al Basha, Anna Eplényi PhD, Gábor Sándor
Szent István University, Faculty of Landscape Architecture and Urban Design, Hungary

Abstract. Throughout the history of landscape design, we have witnessed many examples where natural features were used as symbolic elements of manmade landscapes and gardens. This influence of landscape geology had its impact on contemporary landscape architecture, resulting in diverse and innovative applications, which are the main topic of our discussion.

The article is intended to demonstrate the trend of drawing inspiration from natural landscape features in contemporary landscape architecture in a new and complex way, focusing particularly on the influence of geology, geomorphology and tectonics.

A study was conducted on twelve available, published contemporary landscape projects from the last two decades analysing the imitation of nature in the designs, with photo documentation and description. The aim is to identify how 'native geology' can influence today's landscape architecture, which formations are inspirative, where and how they are integrated to the contemporary artistic design.

Furthermore, in order to develop a complex understanding on how these references applied to the sites enhance the experience of the space. The selected projects are compared according to pairs of contrasting qualities that are related to measurable characteristics of a space. This will finally lead to identifying some common trends of today's landscape architecture in applying this geology-inspired design approach.

Keywords: geological formations, geological patterns, geomorphological influence, mimicry, abstraction

Introduction

The masterpieces in garden history and of landscape design are usually inspired by landscapes, landforms and natural phenomenon: such as coasts, riverscapes, caves, mountains, rocks or special vegetation. There is an important link between the site-specific reality of natural landscapes and the ways of their abstraction on the designer's desk. How a particular location, a real site can influence the landscape architect's aims and design concept? How many types of transformations can the original phenomenon have? In this article, we only focus on a particular source of this transformation, the influence of geology, geomorphology and tectonics. Searching, describing and comparing contemporary design projects, we aim to develop an understanding on how 'native geology' can influence today's landscape architecture, which forms are inspirative, where and why they are applied, and how the original geomorphology is applied.

Geology and garden art – Historical overview (Figure 1)

There is a great difference between the Eastern and Western approach in applying natural landforms into garden design: the Western approach (originating from the Bible) says: the "Eden Garden" is a separated, fenced, sheltered part of landscape; saved from dangerous, outer rural life. These gardens were associated with a maintained, well-kept, artistic and friendly nature. Therefore, the garden, the humanized nature has always been more appreciated than the wild, rustic phenomena. On the contrary, at the east (Chinese, Japanese art), where amazing vertical hilltops, narrow valleys and large rocks were the birthplaces of kami and chi energy, the garden is only a small, reflective copy of the great, boundless, impressive nature.

Therefore, the adaptations of real sites to garden art took a very different symbolic route in European garden history. In Japanese garden art, the abstraction of geomorphological sites already appeared in Kamakura period: the dry stone waterfall-setting (kare-taki) of Saiho-ji or Tenryu-ji remind us the natural waterfall structures of Japanese countryside, as well as the pebble stone dry streams (kare-nagare). The imitation of Oigawa River at Koishikawa Korakuen Garden (Tokyo) is a delicate example: the shoal riverbed with random stones imitates the original low tides. When looking at the two flat upstanding stones in Daisen-in (Daitoku-ji, Kyoto), we can clearly recognize the Mt. Horai from the silhouette, surface and greyish color.

In Chinese garden art, we are aware that the 40 Scenes of Yuangmingyuan were also strongly influenced by Southern Chinese landscapes that Emperor Qianlong personally visited. Not only stones, but also plants and houses were carried to Beijing for recreating the character of those sites as accurately as possible!

Fig. 1. Features from garden history inspired by geology [drawing by Anna Eplényi]

In Europe, it was the Ancient Greeks who emphasized designating sacred locations in the rural landscape, and furnished them by adding some altars, natural pools, and preserving old trees around (Cave at Eleusis: Persephoné's passage to the underworld). The picturesque Temple of Vesta at Tibur cliffs later inspired many monopteroi on rocks in classical parklands (Park Buttes-Chaumont, Eisenstadt- Esterházy Park).

In the Renaissance and Baroque garden arts, the rustic naturalness was usually symbolized with a grotto. The word 'grotto' comes from the Greek word kruptos, meaning 'hidden'. It invokes depth, darkness, silence and mystery. Although we can hardly identify any real cave that served as a source of inspiration, the material was taken from crystal caves and placed accurately like stalactites with shells, or flinths, tufas and peddle stones. "The Crystal Grotto at Painshill is a magical, naturalistic cave with shimmering, bubbling water, rough rock and stalactites covered in sparkling crystals. The grottoes Ch. Hamilton saw in European gardens had water, rough rocks but were more architectural as structures. He may have seen some

of the natural caves along the Roman coastline of Italy (Capri Blue Cave)." A special feature here is that the light-reflections are coming from underwater.

On the Continent, we can find Europe's largest and oldest artificial volcano in Wörlitz Park. It is a reference to Vesuvius what Leopold III, Duke of Anhalt-Dessau personally visited. He was inspired to create his 'model Vesuvius' according to the volcanological researches of Sir W. Hamilton, British envoy, whom he had met in Italy in 1766. That is how the red Villa by the rock was dedicated to him. Grottos were easy to combine with other landforms such as hilltops: (Eisenstadt), caves (Tata Hell grotto), retaining walls (Villa Medici di Castello) or lakeshores (Stourhead). These combinations could have various narrative stories.

An exact reference to the Alps can be found in Laxenburg Schlossgarten (Vienna, ~1800) where great stones are piled up to formulate dramatic, underworld spaces, caves, bridges and lookout spots. In the Türkenschanzpark, upon Vienna hills, waterfalls and ravines with a hanging bridge combined with pines and dark conifers also remind us of the Alpine landscape character.

F. Steele used fine grading and sophisticated references to local landscape. Close to Maine coastal shoreline lays the Camden Library Amphiteather (1928). In addition to the birch planting, large rocks were incorporated into the terraces to soften the rigidity of the regular curves and to evoke the presence of the nearby dramatic coastal ledges, serving both aesthetic and spiritual purposes. The traditional horseshoe form is combined with a modern touch of the rocks, creating ageless harmony.

The sculptor, I. Noguchi used his Japanese 'touch' to realise abstract terrain visions: the Sunken Garden (1964) is a sdepressed brick-lined water garden, where the main features are boulders, which Noguchi collected from Kyoto's Uji River. The California Scenario (1980) is a 1.6-acre public sculpture garden, created as a series of landscapes within a landscape: Water Source/ Water Use/ The Desert Land/ The Forest Walk/ Land Use and Energy Fountain are distinct schemes that symbolise characteristics inherent to the Californian landscape. It is both a metaphorical garden and a minimalist theatrical installation – a story made by so many type of real rocks native to the desert!

L. Halprin was also inspired by landforms. Instead of minimalism, he used the dynamics of run-off waters, the great American canyons and waterfalls as sources of inspiration. The stratigraphy of the canyons (=order of geological layers) are reflected in Lovejoy Fountain Plaza (Portland, 1960) by the structure, layout and fall of the terrain-levels throughout the plaza. The stepping stones in the pool and the narrow, torrential ravine are also abstractions of these geomorphological features. The Ira Keller Fountain (Portland, 1970) has stronger vertical and acoustic power: "this new type of people's park, where nature is abstracted with a geometric naturalism, was based on Halprin's studies of the High Sierra's spring cascades."

Some of the postmodern public spaces have also narrative geomorphological references, such as the elevated, Italy-shaped terrain-cascade by Ch. Moore in Piazza di Italia (1978) or A. Isozaki's Tsukuba Centre canyon with the Daphne tree (1979), the Canyoneaustrate waterfall of artist G. Singer in Park Bercy (1986), or the giant, surrealistic water ripples and roars of Park Diderot by A. Provost (1992).

To sum up this historical review, we can say that there has always been a reference to nature, but until the 20th century, they were rather one-to-one, real copies of the sites. The use of hints, abstractions, minimalist references or evocations appeared only in Japanese garden art or in the last century.

Representations of geology in contemporary landscape design

This part reviews 12 contemporary design projects from the last two decades, which demonstrate an influence of geological patterns and formations in their design concepts. The projects were chosen in an attempt to show the variation of interpretations of this influence, by way of example, not exhaustive enumeration. They are listed in ascending chronological order with a brief description of the design as well as the geological/geomorphological feature, which the design takes the inspiration from.

Federal Courthouse Plaza, 1997
Minneapolis, Minnesota, U.S
Urban Public Space
Designer: Martha Schwartz

Design_ The plaza is designed in front of a new federal courthouse to accommodate both civic and individual activities, with the aim of creating an urban plaza with its own identity. The entire surface is designed with a linear paving pattern of white stripes of concrete, with drop-shaped grass mounds juxtaposed at 30 degrees angle.

Fig. 2. The artificial drumlins in the plaza compared to the form of a natural drumlin.[Photo© Left: msp.world, Right: geocaching.com ID-GC82N03]

The elliptical mounds are soil planting-piles, as the plaza is designed on top of a parking garage, and intended to evoke a memory of geological and cultural forms as well. They suggest a field of glacial *drumlins* [5].

Geomorphological Influence_ A *drumlin* is an oval or elongated hill formed as moving glaciers deposited tills of clay, sand, silt and gravel on outcroppings in their paths. Drumlins can be found in clusters called an "egg basket" numbering in thousands. Drumlin fields were formed in the late Wisconsin glacial stage.

The imitation of drumlins communicates a reference to Minnesota's natural and cultural landscape history, which addresses the collective memory of the visitors and leaves them with an emotional imprint. Although the design suffices to using the explicit three-dimensional elliptical form of drumlins without other elements contributing to the attempt of creating a reference to a certain environment, the effect is still quite strong and dominant over the space, due to the intensive number of mounds and their functional role in orienting movement throughout the plaza.

Interpolis Headquarters Garden, 1998

Tilburg, the Netherlands, Public Garden

Designer: West 8

Design_ The garden forms a calm and introverted world designed for relaxation, relatively separated from its surroundings but freely accessible by the public. The design is strongly influenced by natural geological features. The grass surface has a pattern of tectonic shifts. An elongated plateau of large slate slabs is laid out against the building, imitating a natural *slate landscape*, and is topped by a punctuating layer of a magnolia grove spread across its surface [6].

Geological Influence_ *Slate* is a fine grained, foliated, homogeneous metamorphic rock composed of clay or volcanic ash through low-grade regional metamorphism. Slates display a property called fissility, forming smooth flat sheets of stone.

The massive layer of Norwegian slate, which is known as one of the local roofing and flooring materials in the Netherlands, forms a bleak landscape against the building, creating a counterweight to the heavyweight architecture.

Fig. 3. The garden's plateau of slate slabs compared to a natural slate landscape [Photo© Left: west8.com, Right: alamy.com ID-KK7T85]

The interpretation of tectonic shifts with the grass surface is two-dimensional and serves a simple decorative role, but still creates a changing sense of perspective in the garden.

Teardrop Park, 2004

Manhattan, NYC, U.S, Public Park

Designer: Michael Van Valkenburgh Ass.

Design_ The park displays a distinctive spatial structure with components like a marsh, an ice-water wall and water play rocks, which mimic natural forms of the Hudson River Valley, providing an experience of natural environment for the citizens and kids. A distinctive reinterpretation of New York geology is the ice-water wall that is constructed with stacked Alcove bluestones to resemble a natural *stratum* [7].

Geological Influence_ A *stratum* is a layer of sedimentary rock or soil, or igneous rock that was formed at the Earth's surface, with internally consistent characteristics that distinguish it from other layers. It appears with parallel layers known as strata. The term *bluestone* is derived from a deep blue-colored sandstone first found in Ulster County, New York, known for its durability and color [4].

Another manifestation of the Valley's environment is designed as an area for creative playing. Water play rocks create functional elements for interaction, indicating a geomorphological influence of the Hudson River rocks.

The project imitates the natural environment of the Valley by different means: intricate textures, scale differences and choreographed views, providing the experience of nature play in the city. The elements used to create that imitation are mostly 3D formations that could be easily assigned with functions, while generating the spatial structure of the park.

Fig. 4. The ice water wall compared to a rock strata closeup. [Photo© Left: MVVA, Right: stock.adobe.com ID-156885999]

Fig. 5. The water play rocks compared to rocks on the bank of the Hudson Rive [Photo© Left: MVVA, Right: shutterstock.com ID-294723539]

Fig. 6. The representation of karst in the project compared to its appearance on the summit of the Silberen plateau. [Photo© Left: VOGT, Right: Uwelino / Wikimedia Commons]

The Green, 2010

Novartis Campus,Basel, Switzerland

Hybrid of square and park

Designer: VOGT Landscape Architects

Design_ The Green is intended as an entree for the surrounding buildings and meeting place for persons from the entire campus. The design refers to distinctive elements of *karst* landscape of Silberen, and reinterprets them in the context of the urban environment. The result of this adaptation is an open space: green in its center (forb-rich lawn), light-colored on its brinks (limestoneflagstones) [8].

Geological Influence_ *Karst* is a topography formed by the dissolution of soluble rocks. In the case of eroded limestone, flat barren landscapes are formed, perforated by furrows and holes.

The Green presents subtle discrepancies like the garden plants or high ash trees, which cannot be found in karst, indicating that the influence of karst landscape is achieved by geological mimesis. The simple design concept of a two-dimensional phenomenon covering the entire surface of the space was utilized effectively in dividing the space and creating a reference to a certain environment. The design looks like a carpet taken from the landscape wtith sensitive tactile impressions.

The City Dune - SEB Bank, 2010

Copenhagen, Denmark, Public Urban Space Designer: SLA

Design_ The City Dune is an artificial terrain that rises from street level to the second floor level, covering the bank's parking garage. It is inspired by natural processes and emulates the folding movement of the sand dunes of Northern Denmark and the snow dunes of the Scandinavian Winter. The design of the terrain handles drainage, accessibility, lighting, plantation and offers a variety of routes for different users, creating an ever-changing urban space [9].

Geomorphological Influence_ The dunes in the north part of Denmark are called *shoreline dunes*. They were formed by the aeolian processes and made up of sand. Dried sand on the banks was accumulated by wind from sea alongshore. Shoreline dunes may stand alone or be clustered.

The abstraction of folding movement of the dunes provided the answer to functional and technical demands, and at the same time endows this urban space with a strong and unique Nordic identity. The rhythms of planting design also echoing the succession habitats. Similar to the previous project (the Green), the design concept is intensive and applied to the whole area of the site, playing a functional role and bringing a sense of identity.

Fig. 7. The artificial terrain appearance compared to a migrating coastal dune in Denmark [Photo© Left: SLA, Right: Matthias Schalk / Wikimedia Commons]

Esplanade Paul Grimault, 2011

Annecy, France, Plaza,

Designer: Agence APS

Design_ The project adopts a contextual and sensitive approach in an attempt to recreate the story of the esplanade. The project refers to places and experiences known by mountaineers by several means. The triangle of the plant esplanade with its location on a flat terrain and the design vocabulary refers to the geography of limestone "*plateau" and the Parmelan lapiaz* [10].

Geological Influence_ The *lapiaz* is called karren in the Earth science. Karren is the group of solution microforms on groopved karstifiable surfaces created by rainwater.

The project uses references to the local mountain environment in a subtle and abstract way, bringing the esplanade back into context with its environment and the native vegetation; while the material was switched to concrete instead of the limestone. The interpretation is two-dimensional and decorative, it is not assigned with other functions that could allow more interaction with the users.

Fig. 8. The use of concrete and vegetation in referencing the grooves of lapiaz in the plaza compared to the actual appearance of lapiaz [Photo© Left: Agence APS, Right: Jean Philippe Delobelle]

Fig. 9. The simplified geometric forms used in the park compared to the dynamics of alluvial braided streams [Photo© Left: Florian Holzherr, Right: worldatlas.com]

ECB Premises - Head Office, 2013

Frankfurt, Germany, Urban Park

Designer: VOGT Landscape Architects

Design_ The design takes its basic idea from the most powerful feature of the site, the river, by abstracting the typical terrain of natural flood plains. The park is a stylised *alluvial landscape* with clefts and plateaus, backwaters, undercuts and slopes abstracted to simple geometric forms, creating several zones within the dynamic of the moving terrain. The vegetation also represents the alluvial environment, even though it does not exclusively display native alluvial species. Along with widely spaced indigenous trees, dense woods and natural hedges, many exotic plants can also be found in this designed habitat [8].

Geomorphological Influence_ The alluvial streams are those which flow on their own alluvium (= material deposited by *rivers).*

The reference to the alluvial landscape with a sense of perplexity and the use of clear geometric lines and shapes, and various size, color of gravels – like sediments, allow the park to ease the transition between the buildings of the site and the river. The interpretation of this geomorphological influence is intensive and attempts to present a complex habitat with materials, plants and forms even though those forms are simplified and abstracted.

Metamorphous, 2015

Vancouver, B.C, Canada, Wall Sculpture

Designer: Paul Sangha Landscape Arch.

Design_ The project aims to enhance the foreshore and deal with the retention of the bank. In addition to strategic boulder placement along the foreshore, which facilitates creating habitat for flora and fauna, the design includes a corten steel retaining wall, created as an abstraction of sandstone formations seen on Saturna Island in British Colombia [11].

Geomorphological Influence_ Sandstone belongs to the group of clasolite sedimentary rocks, built up of sand grain and bonding. Most typically, the sand grains can be silica sand, the binding can be silicic acid, calcite or clay. Colour and strength of rock depends on binding.

Fig. 10. The corten steel retaining wall compared to Saturna Island sandstone formations [Photo© Left: Tim Swanky, Right: Paul Sangha Landscape Architecture]

The abstract form of the wall is both functional and artistic, that besides performing as a retaining wall is also is helping to sculpt an identity for Vancouver's shorelines.

Barangaroo Reserve, 2015

Sydney, NSW, Australia

Landscape - urban

Designer: Johnson Pilton Walker/ PWP

Design_ The new harbor foreshore park was intended to provide new contemporary functions. Water-jetted blocks of sandstone, quarried on the site, a material that references both the topography and the building material of early Sydney, were used to form the foreshores and accommodate functions. The sandstone bedding was set north-east to south-west mimicing natural *tessellated pavement*, with the weathering patterns found on Sydney's exposed sandstone escarpments [12].

Geomorphological Influence_

Tessellated pavement consists of relatively flat rock surfaces, typically the tops of sandstone beds and other sedimentary rocks, which are subdivided into regular rectangles or blocks approaching rectangles by systematic orthogonal joint systems. The sandstones can be classified by grain size and level of cohesion. Coarse-grained sandstone is built up of sandgrains with a diameter of 2-0.05 mm.

The resulting configuration mimics a natural formation in a stylised way, integrating contemporary functions with cultural references and natural processes, which adds enormously to the overall quality of the park's design.

The interpretation of the geological phenomenon in the design is quite intensive, applied on the entire shoreline around the park and is assigned with functions, which makes it a main feature in the park.

Fig. 11. The new harbor foreshore compared to natural tessellated pavements in Australia) [Photo© Left: Barangaroo Delivery Authority, Right: robertharding.com 83-12018]

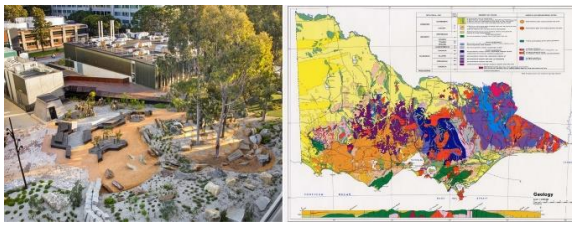


Fig. 12. The display of the rocks in the garden compared to the geological map of Victoria in 1982 [Photo© Left: John Gollings, Right: earthresources.vic.gov.au MP-M-42127]

Earth Sciences Garden - Monash University, 2016

Clayton, Australia, Garden

Designer: Rush Wright Associates

Design_ The design is a new form of system garden. It is an outdoor teaching laboratory that displays key features of the geology and geomorphology of Victoria. The garden displays 20 different types of rocks, which were selected by tracing the shapes and forms of Victoria's geological and geographical features. Plantings also echo the environment of specific Victorian regions. All components are specifically arranged so that students may map and understand the fundamental geological and geomorphological processes of Victoria [13].

Geological Influence_ The geological history of Victoria dates back to one billion years ago. The variety of this rich history appears in several geographical regions, such as the rocky Gippsland and Otway coasts, the western volcanic plains, the sandy dune fields of Wimmera Mallee, the bend of Yarra River, and the outline of Lake Tali Karng.

The garden echoes complex environments of different regions of Victoria in an interesting way. Although the geological interpretation contributes mainly to an educational function, it was applied in a way that integrates geological science with landscape architecture and art, creating a place to be enjoyed by everyone, not only students.

L'enfance du pli, 2017

Meyrin, Geneva, Switzerland

Park – Playground, Designer: Gilles Brusset

Design_ The Fold's childhood is an interpretation of the force that spawned the folded and undulating landscapes of the Jura massif. Meeting of two formal systems: the orthogonal landscape of Meyrin Park and the nearby flat facades of the École des Boudines, the sculpted landscape emerges with dynamic undulation of the ground creating a unique space for children. The design is simple and clear, the grass reminds us of the Jura pastures [14].

Geomorphological Influence_ The *Jura* is a part of the Alpine foreland. Toward the northeast and along the outer ridges of the arc, the elevations of the crests are lower. The main thrust of the deformation process occurred from the southeast during the Pliocene Epoch. The mountain-building process took place in two thrust phases: the first one formed the outer, French chain of ridges, and the second thrust formed the adjacent, higher inner ranges. Pastures on the high plateaus are more characteristic to the Jura than are the cultivated fields in the basins and valleys.

Fig. 13. The spatial structure of the park compared to the ridges and valleys of the Jura Massif [Photo© Left: Pierre-Yves Brunaud, Right: C Pelan]

The project's mimicry appears in curves and volumes, providing children a physical experience of a distinctive spatial structure. This interpretation is the main feature of the site and assigned with function, which gives it a strong dominant effect on both the use and the perception of the space.

Summer Island - The undulating landscape from the data matrix, 2019

Heilbronn, Germany, Public Landscape Park

Designer: LOMA

Design_ The park is one of the world's first digitally-designed and built parks. The design presents organically shaped terrain-waves joined up diagonally at an angle to imitate a *sandy landscape* and its ephemeral patterns, natural shapes of dunes and moraines. There is neither an entrance nor an exit, no paths and no benches, since the green dunes divide the space and serve these functions [15].

Geomorphological Influence_ Two similar types of forms are described by geomorphology. 1: Sand waves are created at the bottom of the bed by the process of traction load. 2: Ripple-marks are created by wind and their forms are parallel with each other.

The design inspiration was drawn from a general phenomenon, not related to the local environment of the site, and was applied quite intensively to the whole area of the site, The result of this imitation of a sandy landscape is a 'walkable sculpture', a green sea of waves for people to sit, climb, sunbathe or joyfully roll around.

Fig. 14. The organically shaped terrain-waves of the park compared to linear dunes of an erg [Photo© Left: Nikolai Benner, Right: nasa.gov ID- ISS047-E-23405]

The aspects of projects comparison (Figure 15)

After collecting and describing the listed projects, a concise comparative sheet has been prepared to conclude the design tendencies of nowadays. The structure of the comparison is based on pairs of contrasting qualities in the form of semantic differential scales. The projects are identified with numbers (1-12) that are placed on the bar.

Defining the counterpart-qualities / comparison aspects:

- Decorative / Functional = this pair describes whether the design has only a decorative, ornamental approach (nice pattern, form), or it rather fulfills functional aims, such as educational purposes, displaying plants or designating parts of it for sport activities, play or leisure.
- Local / General = this pair compares the geological origin, whether the applied formation originates from a close-by, site-specific landscape which gives the site a sense of local identity; or the design refers to a more common, universal geological pattern.
- Areal 2D / Spatial 3D = this aspect refers to the spatial qualities, whether the design translates the geomorphological origins into patterns or pavements, or applies it as a sculptural form of volumes and spatial experiences.
- Moderate / Intensive = this pair relates to the previous one, while the moderate design appears with limits, on a part of the area; the intensive design takes over the site, so that the whole character of the site is mainly influenced by the geological reference.
- Geology / Complex Habitat = this aspect seeks to distinguish if the design takes only the natural rock as a source of influence, or it has a wider context: including local vegetation or landscape patterns as well.

The comparison chart (Fig. 15) presents the authors critic of the projects in accordance with the chosen pairs of qualities.

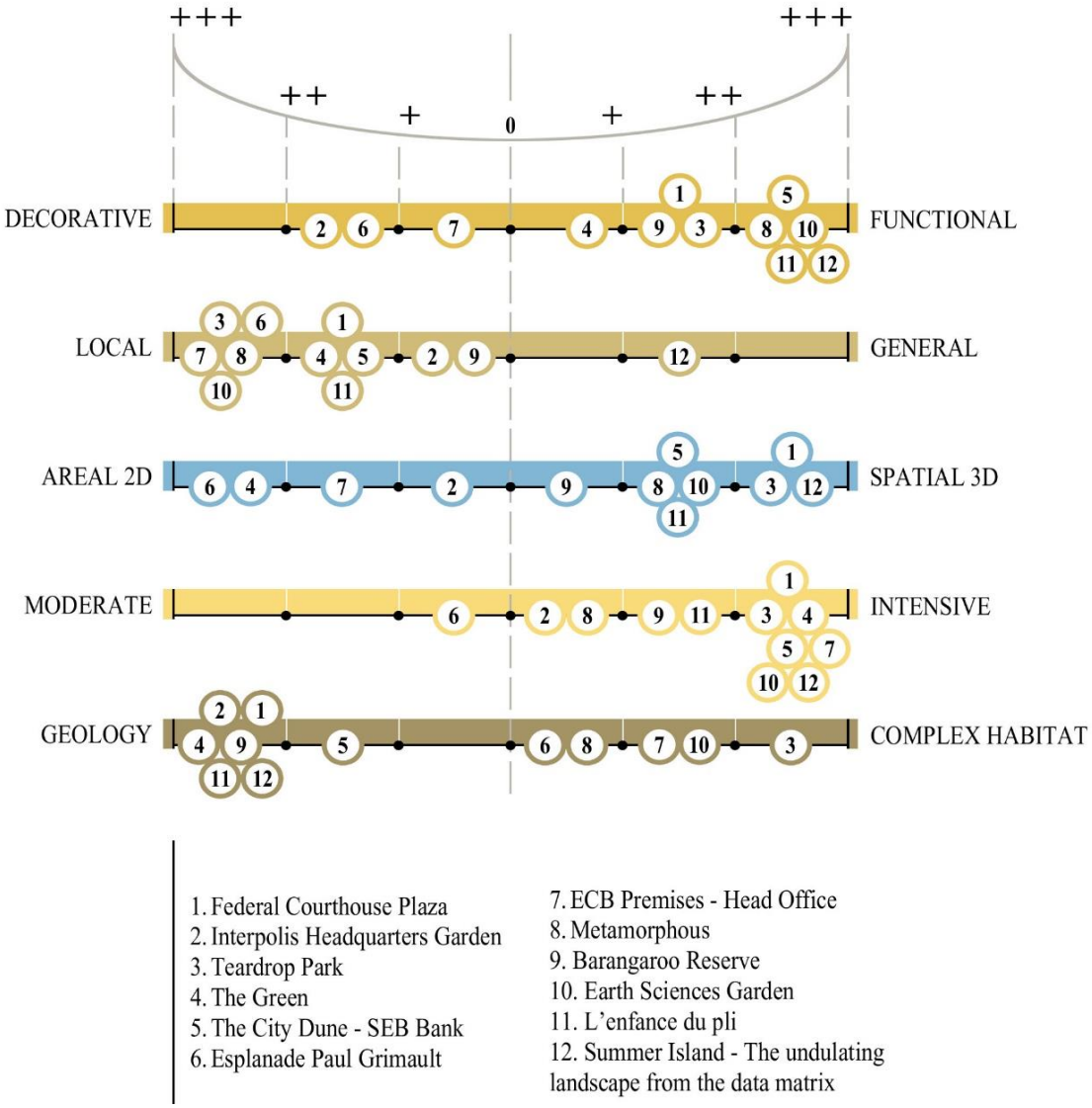


Fig. 15. A comparative chart of the 12 analysed projects [created by the author]

Results and Conclusions

The chart demonstrates some common tendencies regarding geologically influenced contemporary designs:

- The last *15 years were especially rich* of urban design projects imitating and mimicking geology in very different ways. It is assumed, that contemporary open-air design do use this elementary, background layer of natural feature.
- Most of the projects tend to utilise *their geological interpretations and assign functions* to the features even if they contribute merely to the division of the space or the orientation of movement.
- Most of the references are *strongly related to local or regional natural features* that are very well-known and familiar in the collective memory of the local users. It is assumed, that providing an emotional impact for the users would strengthen the spatial identity and spatial attachment.

Both, 2D patterns and 3D formations of geological features are inspirational sources for contemporary designs. However, the designs that adopted a *3D approach showed more complexity*, and were able to have not only decorative roles, but *also to provide functions*, allowing for a better interaction and contributed more effectively to the experience of space.

The *geological influence determines all other elements* contributing to the design. It is expressed clearly and explicitly. Whether the interpretation is applied on the whole site or on a limited section, and whether it is an artistic abstraction or an exact duplicate, the *geological influence remains the main factor* that defines the spatial experience.

Most of the projects tend to *focus on a single natural feature* and communicate it with a clear visual appearance rather than including all the associated features within the bigger complex habitat.

To sum up, we can state that, contrary to the mentioned historical approaches, which mainly relied on copying real sites and creating duplicates of existing nature, the *contemporary design approach tends to prefer abstraction of natural features*. References and interpretations are more artistic: conceptual, delicate or sometimes even unnoticeable. Design takes inspiration from the *textures, colors, structure, patterns, native vegetation or volumes of a geological phenomenon*, rather than duplicating the exact phenomenon. This tendency started in the middle of the 20th century, but in the last two decades, it started having more of a design appearance, underlining the message that landscape architecture should be based on geology again!

On another hand, this contemporary approach can play a balancing role as a response to one of the main phenomena of this age, globalization. As globalization processes are exposing most parts of the world to similar influences, people start feeling insecure as their cultural underpinning weakens [2]. This cultural insecurity leads people to look for recognizable points of reference in their own surroundings, and the contemporary design approach is keen to providing these local references, a task made only easier by relying on the principle of drawing inspiration from the geology of the local area.

To sum up, we can state that, contrary to the mentioned historical approaches, which mainly relied on copying real sites and creating duplicates of existing nature, the *contemporary design approach tends to prefer abstraction of natural features*. References and interpretations are more artistic: conceptual, delicate or sometimes even unnoticeable. Design takes inspiration from the *textures, colors, structure, patterns, native vegetation or volumes of a geological phenomenon*, rather than duplicating the exact phenomenon. This tendency started in the middle of the 20th century, but in the last two decades, it started having more of a design appearance, underlining the message that landscape architecture should be based on geology again!

On another hand, this contemporary approach can play a balancing role as a response to one of the main phenomena of this age, globalization. As globalization processes are exposing most parts of the world to similar influences, people start feeling insecure as their cultural underpinning weakens [2]. This cultural insecurity leads people to look for recognizable points of reference in their own surroundings, and the contemporary design approach is keen to providing these local references, a task made only easier by relying on the principle of drawing inspiration from the geology of the local area.

References

1. **Weilacher**, **Udo.** (2005). *In Gardens: Profiles of Contemporary European Landscape Architecture*: Birkhäuser.
2. **Simon, C. J. M.** (2005). *Ruimte voor identiteit: De productie en reproductie van streekidentiteiten in Nederland*: Groningen.
3. **Jodidio, Philip.** (2012). *Landscape Architecture Now!*: Taschen GmbH

4. **Isachsen, Y.W, Landing, E, Lauber, J.M, Rickard, L.V, Rogers, W.B.** (2000) *Geology of New York, A Simplified Account:* New York State Museum.
5. **Martha Schwartz Partners** [online 10.10.2021.]. https://msp.world/minneapolis-courthouse-plaza-minneapolis-mn-usa/
6. West 8 office for urban design and landscape architecture [online 10.10.2021.]. https://www.west8.com/ projects/interpolis_garden/
7. **Michael Van Valkenburgh Associates** [online 10.10.2021.]. https://www.mvvainc.com/project.php?id=2
8. **Vogt Landschaftsarchitekten** | Vogt [online 02.12.2021.]. https://www.vogt-la.com/en
9. **SLA – Urbanity**. *Strategy. Landscape* [online 10.10.2021.]. https://www.sla.dk/en/projects/city-dune/
10. **Agence APS** [online 10.10.2021.]. https://www.agenceaps.com/realisations-aps/amenagement-esplanade-grimault-annecy/
11. **Paul Sangha Creative** [online 10.10.2021.]. https://paulsangha.com/project/metamorphous
12. **PWP Landscape Architecture** [online 10.10.2021.]. http://www.pwpla.com/projects/barangaroo/&details
13. **Rush Wright Associates** [online 10.10.2021.]. http://www.rushwright.com/earth-sciences-garden-monash-university
14. *Landscape Architecture Platform* | *Landezine* [online 10.10.2021.]. https://landezine-award.com/folds-childhood-2/
15. **LOMA architecture**. *Landscape, urbanism* [online 10.10.2021.]. http://www.loma-online.de/

This article is published within the framework of Hungarian Academy of Arts: Anna Eplényi – Scholar 2018–2021, with the research topic Contemporary terrain modeling – artistic landforming.

AUTHORS:
Nawarah Al Basha, PhD student, Landscape Architecture MA, Institute of Garden Art and Landscape Design, Szent István University, Budapest. A previous tutor at the Faculty of Architecture in Damascus, Syria. She focuses her research on spatial identity, spatial attachment and landscape forms and patterns. E−mail: Albasha.Nawarah@hallgato.uni-szie.hu
Anna Eplényi PhD, Associate lecturer at the Institute of Garden Art and Landscape Design, Szent István University, Budapest. She teaches garden history, freehand drawing and other creative art modules. She focuses her research within the framework of Hungarian Academy of Arts on contemporary, artistic terrain modelling. E−mail: eplenyi.anna@tajk.szie.hu
Gábor Sándor, assistant lecturer at the Department of Landscape Protection and Reclamation, Szent István University, Budapest. He teaches Hungary's landscape geography, soil investigation on fieldwork and other landscape architecture-related modules. He focuses his research on geological values, urban soil and soil classification. E−mail: sandor.gabor@tajk.szie.hu

Kopsavilkums. Pētījums veikts par divpadsmit pieejamiem, mūsdienās publicētiem ainavu projektiem pēdējās divās desmitgadēs, izvērtējot dabas imitāciju caur fotofiksācijām, dokumentiem un aprakstiem. Analizētie projekti savstarpēji salīdzināti pēc vienotām kvalitātēm, izmēriem, telpas raksturlielumiem, kas ļāvis noteikt dažādas mūsdienu ainavu arhitektūras kopīgās tendences, nodefinējot atbilstošas dizaina pieejas ainavtelpas izveidē.

DOI: 10.22616/j.landarchart.2020.17.06

From global problems to the local action in the Community Garden "*AUDZ*"

Nora Gavare, *Art Academy of Latvia, Latvia*

Abstract. The community garden "*AUDZ*" which is accessible for everyone was created as a local small scale response to the problems of the 21st century – the depletion of natural resources, air pollution, increase in industrial production, a destructive amount of waste, aging of society, the lack of a sustainable society, etc. Nora Gavare, a designer, participated in the ERASMUS+ international training mobility visit "Development of urban environment" in Hong Cong where she acquired experience and new insights into over-population, rapid growth of urban areas at the expense of the natural habitat and a sharp increase in demand for food products. These trends are not yet evident in Latvia, but they are relevant in the context of the forthcoming climate crisis. At the same time, the demand for healthy locally grown food and zero waste products has increased noticeably. Residents of cities and towns are eager to buy products of known origin, quality and processing factories. However, the only way how to be fully convinced of the quality and "transparency" of the food products is to grow and prepare food stuffs on our own. There are the following questions to be answered: "Do we have enough knowledge how to grow, for example, tomatoes? Haven't people forgotten natural processes while using the advantages of the development of technologies? What would happen if we created PLACES where people could both explore and learn, share and experience?"

As regards such towns in Latvia as Sigulda, where there is a rapid growth of the population and the number of declared residents, it is necessary to promote the creation of the sense of community and education processes due to the lack of the communication opportunities which would promote the interaction of different social groups and enhance the formation of a sustainable society. Such a conclusion was made by performing a photo mapping of Sigulda's public environment in different periods.

Keywords: community garden, universal design, sustainable lifestyle

Introduction

The research of the context of the town and the place, and the needs and habits of residents were conducted in the spring of 2019 in the framework of the master thesis in the study programme of the Latvia Academy of Arts (the supervisor L. Jākobsone), and the project "*Community Garden_AUDZ*" open to the public focusing on the social, experiential and universal design based on the principles of openness, inclusion and participation was developed. The community garden is not only the place where vegetables are grown but also it is a PLACE to create an understanding of the synergy of human beings, nature and time. The community garden is part of the culture of the future, part of self-sufficiency and responsible living. The garden serves as a meeting and communication place, as well as the bridge between different social groups. The idea of the project "*AUDZ*" is to bring the town's residents together and develop gardening in the urban context and thus share and gain knowledge by increasing awareness of the origin of food, as well as promoting the movement of a healthy living and sustainable lifestyle. Fresh and reliable food is a reward for work done, the result of inclusion and participation, care and meaningful activities.

Gardening in the 21st century

In the last century, the size of land allocated for horticulture and food production in cities has been gradually but steadily decreasing and leaving only scattered small oases in the western big cities. This can be explained by the rapid increase in the value of land and a strong competition, while "new" technologies, such as different types of coolers, have allowed food to be stored for longer periods of time to be fresh and has made it possible to purchase products from long distances. Today, local farmers' products have already become exclusive, they are available in various specialized weekly markets, night markets, off-site retailing and using a direct selling method to meet buyers' growing desire for healthy, seasonal, organic food. In this context it is also important to mention the fact that knowledge and skills about local agricultural processes and products have become a topic for professionals in the field rather than basic information required by general public [1].

In the last decades in the largest European cities, for example, Berlin, Paris, London and others, new food growing movements have returned to the urban environment, where people grow, harvest and consume the produce together. The emphasis is on the word "together" thus the focus is on the lifestyle trends of modern society. It is when people share the place of residence (couch surfing, airbnb etc.), means of transport (Uber, Zipcar, etc), work places / office rooms (co-working), money investments in different projects (kick-starter etc.). This type of sharing economy provides users with lower costs, an opportunity to earn for a service or product provider,

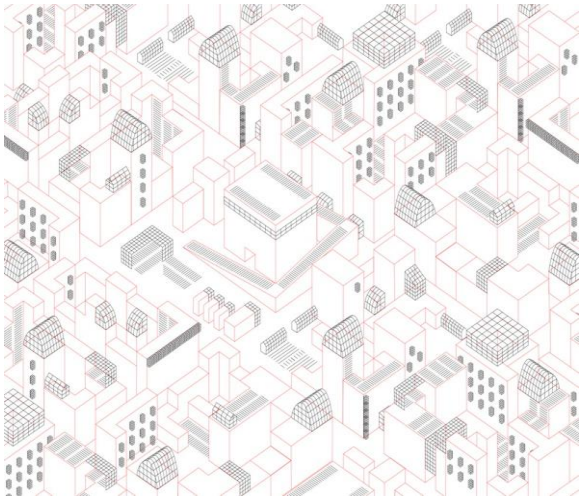


Fig. 1. A utopian (or dystopian?) vision of the future of urban transformation. Greenhouse renaissance [the author: Nora Gavare, Art Academy of Latvia, critical design, the supervisor: L. Jākobsone]

a range of options and, of course, the strengthening of the community due to a personal, individual attitude. The sharing of the garden

"space" is not the only transformation that corresponds to the trends of modern society. Various local and global movements have emerged, for example, food councils, initiatives of edible-cities, mobile community kitchens, food sharing. Also, in recent years food growing has expanded in an increasing variety of ways: gardening on roofs (it is not a brand new innovation of this century though; the air gardens of Babylon existed for about 600 years B.C.), plant and animal farms on floating platforms (Rotterdam), aquaponics capsule cultivation, vegetable roof gardens, plant skyscrapers in Singapore, mobile farms / markets, miniature farms in small residential areas and many more [2]. These new initiatives clearly indicate the public's desire for "transparent", healthy and understandable food, as well as the desire to create natural places in the context of the urban environment. These new initiatives clearly indicate the society's desire for "transparent", healthy and comprehensive food, as well as the desire to create natural places in the context of the urban environment.

One of the future speculations of the author in the framework of the conceptual design course at Art Academy of Latvia was directly related to the changes in the urban environment by focusing on overpopulation, the huge demand for food and a possible technological apocalypse: the city which has the pattern resembling the greenhouse square glass structures and the linearity of garden furrows in various expressions, greenhouses and gardens as appendices to new and already historic architecture (Fig. 1). It is a kind of the network that describes society and its habits as an overall idea in relation to the concept of the *Superstudio* about the continuous monument: an architectural model for total urbanization [3].

Community gardens

If it has been important for European cities to develop the culture of small gardens and promote their revival in recent years, then in Latvia they are still being destroyed – small gardens are being replaced by residential complexes, shopping centres, sports halls, schools, office buildings, parking lots. Although zones of small gardens have often gained a notorious reputation as neglected areas prone to fires, thefts, etc., it may be wiser to improve garden structures by transforming activities and adapting them to modern needs to promote societal sustainability, education and growth.

One of the ways how to transform small gardens is creation of community gardens which act as catalysts. In the context of the community garden, this would be related to the rapid development of the community, promotion of creativity from the project participants and the involvement of people in the processes. It is also important to mention that this kind of transformation of gardens "sows seeds" in the minds of the participants and allows them to be aware of a wide range of growing opportunities in the urban context, sustainability and ecological issues, as well as to prove they can be self-sufficient as a society and influence the environment providing the community with food and be responsible for the environment.

- The type of organization and action may differ among various communities, for example:
- the state and local government financially support such projects with funding from various foundations (for example, the unit of urban agriculture "Agrocite" project in Paris);
- cooperation projects between a local government and a vegetable market (several examples in the Netherlands, including Toetje community garden in Groningen);
- small initiatives to meet the needs of a specific group of people for fresh products (for example, *Pluk en Moestuin* community garden in Eenrum village in the Netherlands);
- pop-up short-term gardens as part of festivals to draw the public attention (a vivid and successful example was *The Union Street Urban Orchard* during London Architecture Festival in 2010);
- projects initiated in the public space by individuals or groups of the population with the aim of drawing the public attention (this category would include public community garden in Sigulda town "*AUDZ*" created in the framework of the master thesis);
- projects involving schools and other institutions, where the community is usually well defined and closed (for example, Ikšķile Free School and permaculture garden attached to it);
- other types of community gardens.

Involvement of society – public participation

Community gardens and other food-related activities open to the public often focus on meaningful activities, change and multidimensional processes. Such movements are part of the concept of 'transforming social innovation', which usually results from alterations in mutual development. Moluaert explains social innovation (included in the book by Ciska) with "community action that creates new rules and social relationships to meet the needs of society and lead to social change and opportunity. The focus of social innovation on changing relationships redefines the potential role of residents in society, as well as their ability to improve the living environment based on local needs" [4].

The factor of participation is important in the context of social innovation thus allowing the society to participate in the development and implementation of creative projects and express the opinion which is important to them, thus creating an emotional connection with the project, place and community. In such a participation process there must be a "project manager" or a creator who is an expert in the field and can lead the group work, engage in mutual communication with the participants involved in the process, and creatively promote the brainstorming of non-standard solutions and ideas. In addition, these participants / end-users may not have knowledge or experience in the specific field (in most cases they do not have). Although it poses various risks to the end result, in the context of social design and the creation of place, such a principle can lead to more effective solutions for the user, easier and more convenient identification of the needs, views and aspirations of the specific group of society and target audience.

Participation in the design process distinguishes four important basic elements in the interaction of which this method can be applied: authors / creators, participants / users, projects and cases [5].

Participation is an integral part of social innovation projects, promoting unity and growth in the community, in the process of placemaking (the Latvian translation of the term was suggested by Ķīnasts / www.nebetja.eu) and certainly in the context of community garden projects, where community interaction and activities are vital for a successful outcome.

The place and environment can act as a catalyst. Careful and inclusive planning, the creation of user-centred design highlight and improve the synergies between people and nature (in the garden context), the environments they create in addition to the communication among people and between people and the community at countless levels.

Meiss has identified three design strategies to assist a sense of identity for people (included in the book by *Carmona*) by creating places for people or their groups:

- "Environments responsive to, and based on designer's deep understanding of the values and behaviour of the people and groups concerned and the environmental features crucial to their identity;
- participation of future users in the design of their environment;
- environments that users can modify and adapt thus letting users to participate in "the design of environment" (Matthew Carmona, Steve Tiesdell, Tim Heath, Taner Oc. *Public places urban spaces. The dimensions of urban design*. New York: Routhledge, 2003. pp. 121‒123).

The community garden "*AUDZ*" is a social project which is based on the principle of public participation and it covers all stages of the project - from generating ideas, creating structures and procuring seedlings to maintaining the garden, organizing activities and participating in them (Fig. 2, 3, 4, 5). In fact, all groups and generations of society are actively involved in the project. Participation in this case refers to creative collaboration in the design process between the designer or the author and users. Participation not only promotes the emotional connection with the project, the formation of a sense of community and place, but also initiates the process of knowledge and experience transfer. In addition, the involvement of residents makes it possible to create a result that is appropriate for the given community.

Fig. 2. Residents and visitors in the process [photo Nora Gavare, 2019]

Fig. 3. Residents and visitors in the process [photo Nora Gavare, 2019]

Fig. 4. View to garden from birth view [photo Nora Gavare, 2019]

Fig. 5. Garden in autumn time [photo Nora Gavare, 2019]

The scale of participation may be varied: 1) small-scale public involvement – starting with giving advice, bringing inspiration books or seedlings; 2) medium-scale public involvement – occasional visits, participation in creative workshops, involvement in making of structures, involvement in garden work processes, environmental testing, etc.; 3) large-scale public involvement – regular visits and participation in almost all activities, cooperation with non-governmental organizations, institutions funded by local government and educational institutions.

The beginning stage of the garden development was arranged in cooperation with Sigulda Pensioneers' Association and organization "Cerību spārni" (in English: Wings of Hope) of young people with special needs, students of Sigulda Art School and State Gymnasium, as well as local residents and garden visitors. Together they created a vision of the idea of a garden today, its role in society, what functions it should perform, and created conceptual garden plans with a game method. Local residents actively participated in the workshops for making garden structures on site, while Sigulda State Gymnasium students created module elements according to the given drawings during the home economics lessons, thus students had the opportunity to develop objects designed for a real purpose to be located in the real urban environment and used by real users.

Spatial planning and accessibility

The most important factors in the garden planning (Fig. 6) have been the availability of the environment and the promotion of mutual communication among visitors. By providing access to the plant beds' arrangement from all sides, the environment provides scenarios for many people to be active in one place and encourages
mutual interaction. In addition, multi-functional communication zone in the centre of the garden which is a structure of asymmetrical shape is meant for recreation, reading, resting, playing table games, having picnics, incidental meetings with other visitors or for using the platform as a stage for performances of one - two artists or master classes.

The garden "*AUDZ*" is divided into zones where structures are gradually raised in height (Fig. 7) with plant bed arrangements which are 15 cm high in the left side of the garden and gradually raised with each next line reaching 90 cm (the rise continues up to the greenhouse and historic Villa Green architectural spaces). Therefore it is possible to grow various plants with different depths of root systems and provide more convenient access to the garden for different generations of visitors and people with different functional abilities. Thus each person instinctively goes in the direction of the area in the garden where it is more comfortable for him /her to work by choosing to squat, sit or stand.

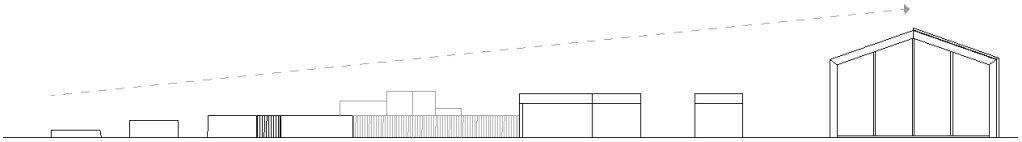


Fig. 6. Cross-section. Gradual rise of the garden structures [the author of the diagramme: Nora Gavare]

Fig. 7. Community garden "AUDZ" general plan [the author of the general plan: Nora Gavare]

The greenhouse and plant beds have been located closer to the parking lot and the hard surface, so that wheelchair users would need to go as little distance as possible to the area available to them.

The action model

The garden should have a clear scheme of activities so that visitors can easily navigate the gardening work and activities in the garden (Fig. 8). The continued involvement of volunteers is certainly a challenge as well. If there is an intense public involvement in a project, the focus is on the factor of responsibility: who is responsible for what and when. Therefore it is important to define the task and the operation framework of the project.

In order to reduce the confusion that most visitors experience in an unusual environment, the garden has signs with invitations to specific activities. The signs, in a sense, reflect the thoughts and desires of plants, as if reviving them and allowing them to speak, for example, «Water me!», «Look at me closer!», «Remove weeds around me!», «Taste me!». Such exclamation sentences encourage exploration, investigation and create new experience using elements of a game. The signs are required to put in a special bowl "The completed work".

The action model of the community garden "*AUDZ*" is characterized by the following directions:

- a social form of new collective action;
- common visions which support and highlight the value of food grown by participants;

Fig. 8. Specific activities in the garden [photo Nora Gavare, 2019]

- self-organised mutual support network which is mostly based on the local community;
- experimental forms of food growing;
- experimental forms of societal growth;
- bonds of trust and identity that create the capacity for social cooperation;
- inclusion and participation of society.

The focus of the community garden is mainly on the growth and interaction of society, which include awareness of problems, education, skills development, participation, mutual communication and encouragement for proactive action. To achieve this, the garden includes several functions – not only the cultivation, care and harvesting of crops, but also various educational thematic events, concerts, talks, community picnics, the exchange of books / and information centre in the greenhouse, markets of local producers / farmers and their organic products and other activities.

Conclusions

The community garden is open not only to a particular community, but also to the general public: local residents and visitors from other cities or abroad are welcome by providing everyone with the opportunity to participate in its creation, growth or experience.

In a sense, the community garden "*AUDZ*" is like a test or a mirror of society to identify its ability to share, to care, to work for a larger group of people and to increase the level of well-being of society as well as individuals. It actively promoted the horticultural movement in Latvia and acted as a catalyst and inspiration for other urban gardening projects.

The project has become internationally recognized and it has received the International Universal Design Expert Award 2020 in Munich and a certificate of the recognition in the competition in Vienna "International Information Design Award 2020".

References

1. **Kropp, C.** Urban Food Movements and Their Transformative Capacities. *The International Journal of Sociology of Agriculture & Food* 24.3 (2018): 413-430.
2. *The Guardian* [online 10.12.2020.]. https://www.theguardian.com/sustainable-business/2014/jul/02/next-gen-urban-farms-10-innovative-projects-from-around-the-world
3. *Superstudio* [online 10.12.2020.].http://arch122superstudio.blogspot.com/2012/06/continuous-monument-architectural-model_15.html
4. **Ciska, U., Luminna, G.H.** Connecting resourcefulness and social innovation: exploring conditions and processes in community gardens in the Netherlands. *Local Environment. The International Journal of Justice and Sustainability* (2018): 147.
5. **Huybrechts, L**. *Participation is Risky. Approaches to Joint Creative Processes*. Amsterdam: valiz , 2014.

AUTHOR:

Nora Gavare, mag. art., urban community garden *_audz_* author (2018), senior interior designer at NŌR interjeri (since 2015). In recent years, increased attention has been paid not only to human-friendly and suitable interior solutions, but also to the issues of creating a humane urban environment and devloping sustainable living conditions and communities. Studied functional design in Art Academy of Latvia and urban design in Hong Kong Polytechnic University School of Design. E–mail: nora.gavare@gmail.com

Kopsavilkums. Kopienas dārzs „AUDZ" ir atvērts ne tikai konkrētai kopienai, bet arī visai sabiedrībai – gan vietējai, gan viesiem no citām pilsētām vai ārvalstīm, rodot iespēju katram piedalīties tā veidošanā, izaugsmē vai pieredzes radīšanā. „AUDZ" savā ziņā ir kā sabiedrības tests jeb spogulis, lai apzinātu tās spēju dalīties, rūpēties, darboties lielākas cilvēku grupas labā un vairot sabiedrības, kā arī indivīdu labsajūtas līmeni. Tas ir aktīvāk virzījis dārzkopības kustību Latvijā un bijis kā katalizators un iedvesmas avots citiem pilsētvides dārzniecības projektiem.

Projekts ir guvis starptautisku ievērību un saņēmis *International Universal Design Expert Award 2020* Minhenē un atzinību *International Information Design Award 2020* konkursā Vīnē.

DOI: 10.22616/j.landarchart.2020.17.07

Interaction of landscape space and indoors in architecture of the open-air concert hall "Mītava"

Aija Grietēna, *Latvia University of Life Sciences and Technologies, Latvia*

Abstract. In the search for balancing factors in the art of environmental design between architecture, landscape architecture, and interiors needed to improve interdisciplinary collaborative planning and enhance the psycho-emotional quality of the environment, the study of landscape space-indoor interaction through comparative analysis and inductive reference is continued. On the Latvian scale, the new, 21st-century technological capabilities in the design and production of wooden structures in the architecture of the open air concert hall "Mītava", constructed in 2019 on Pasta Island. The importance of the structure on the Baltic scale is emphasized by the unique design, which resembles a shell washed on the bank of the Lielupe River, large (<60m) arched timber continuous roof structures and high acoustic characteristics. Original building structures have opened up new opportunities for interaction between landscape space and indoor space, creating a broad, spatial synthesis. The realization of an artistically stylistic concept in the open-air concert hall "Mītava", which is subordinated to the existing landscape space and supplemented with appropriate greenery, is considered a valuable contribution to the urban environment. The specific case study analyzed in detail underlines the importance of successful interdisciplinary collaboration in the harmonious interaction between landscape space and indoor.

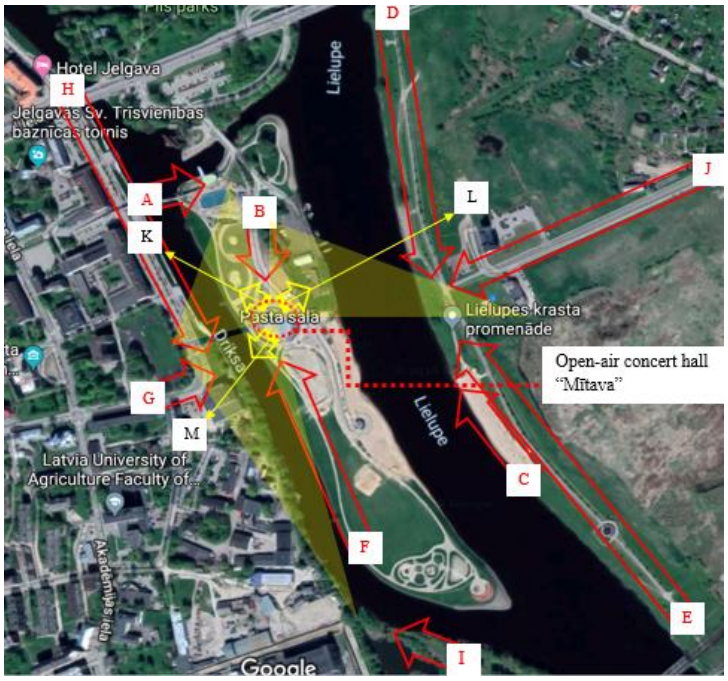
Keywords: landscape architecture, architecture, interaction of landscape space and indoors

Introduction

At the Latvian level, as in the global context, increasing attention is being paid to the balance in all its aspects, as evidenced by one of the most important documents of recent years in the field of architectural policy – the Davos Declaration signed at the 2018 World Economic Forum. This document manifests the concept and principles of *Baukultur*, whose mission is to create and maintain a high quality built environment that will be passed down to future generations [2]. The purpose of Latvian Architecture Policy, which is in line with the concept and principles of the built environment culture as defined in the Davos Declaration, is to create conditions for qualitative design and sustainability of the living space of the individual and society based on high-quality architecture [1].

In the complex construction process of today, environmental makers are striving to stay positive in the face of the growing need for deeper interdisciplinary collaborative planning, and we all as environmental users for environmental integrity and harmony [4; 11; 12; 13]. The actuality of harmonious landscape space and indoor interaction is underlined by the rapidly changing role of architecture, high involvement of environmental users in the processes of creating a public environment and new technological possibilities today. This is not only facilitated by the increasing use of transparent, wide exterior glazed panels in architecture, which visually blends the landscape space with the interior through illusionary and plastic architectural forms [4; 5], but also the direct, extensive connection of landscaping space and interior without glass, which is the result of 21st-century technological capabilities in the design and manufacture of wooden structures. "Thanks to its enormous achievements in engineering, wood is rapidly regaining its position in the global construction market," said A. Domkin (*A. Domkins*), Director of the "Forest and Wood Products Research and Development Institute" [9]. Original, large-span, curved, glued-in wooden structures open up wide and long-awaited opportunities for Latvian architects to creativity, which materializes in modern architecture and more ambitious interaction of landscape spaces and interiors. Maximally open space without glazed planes, partially covered indoor visual communication between landscape space and indoor expands through sound, smell, and tactile capabilities. The pattern of landscape space and indoor interaction today consists of an endless combination of different factors. The most important visual factors are divided into four psychoemotional criteria that help to assess composition and proportions, colour, light and shadow impacted by sunlight, visual accents by chiaroscuro play and visual merging of indoors and landscape space. The fifth criterion are architectural forms in landscape [4; 5]. Pooling the information obtained in two directions (looking from the landscape to the indoor) and vice versa provides a more complete assessment of the interaction.

At the beginning of the 21st century, the Latvian landscape space has become richer with several expressive concert halls, which are very important



A; B; C; D; E; F; G; H; I; J; K; L; M – key viewpoints to the concert hall

Fig. 1. Open-air concert hall "Mītava" in the landscape area with view lines and points [graph created by the author on googlemap, 2019]

for the decentralization of cultural processes in the country. In the summer of 2019, Jelgava City also acquired the long-awaited and vital for the cultural life, the open-air concert hall "Mītava" (Fig. 1), which was built on the Pasta island.

Aim of the research – to identify the contributing factors for harmonious interaction of landscape space and indoors in the art of environment formation in Latvia (in the example of the open–air concert hall "Mītava").

Tasks of the research.

1. To evaluate the interaction of landscape space and indoors in architecture.
2. To formulate the factors of harmonious interaction of landscape space and indoors in the art of environment formation.

The theoretical and practical significance of the work is the formation of psycho–emotionally more harmonious and high-quality spatial environment in Latvia, thraugh better coopertion between architects, landscape architects and interior design specialist.

Materials and Methods

Interaction of landscape space and indoors in architecture of the open–air concert hall "Mītava" in Latvia. The visual research was conducted in September-November 2019 when the author became the user of the research object and took photos. *Reserch methods:* **comporative analysis method** (photographic fixation capture, analysis of interaction factors according to uniform criteria) and **inductive cognitive method (**to generalize the results).

The application of the comparative method in summarizing information for the research

The criteria for evaluation of psycho–emotional interaction of indoors and landscape space:

- evaluation of spatial composition and proportions of glazed surfaces versus the non–glazed part;
- evaluation of compositional application of colour, light and shadow impacted by sunlight;
- evaluation of the usage of visual accents created by chiaroscuro play;
- evaluation of the visual merging of indoors and landscape space.

Evaluation of architectural forms in landscape space.

Results and Discussion

Interaction of landscape space and indoors under the influence of visual perception

Open-air concert hall "Mītava" in Jelgava:

- Address – Pasta sala, Jelgava, Latvia (Figure 1);
- Implementation – 2019;
- Architecture – SIA "Projektu birojs Grietēns un Kagainis", Vents Grietens *(Vents Grietēns)*, landscape architecture – Marta Tabaka (*Marta Tabaka)*; constructions – Peter Supe (*Pēteris Supe)*;
- Realization – IBK (SIA "Igate Būve" un SIA "Kvadrum"), developer and manufacturer of curved wooden constructions – SIA "IKTK" in cooperation with "MeKA").

The Mītava open-air concert hall is the largest of its kind in the Baltic States, with wooden structures

using approximately 530 cubic meters of wood. The largest total span is about 60 meters, which is also a new record in the history of Latvian construction. Continuous beams have a span of 20 to 30 meters each – this is the original work of architects, designers, manufacturer of building structures and builder [6]. The unique roof construction, which resembles a shell washed off the Lielupe River, uses a high-quality roof membrane solution.

The membrane was manufactured, supplied and installed by "Canobbio Textile Engineering" [3; 6]. Main view lines and points when perceptualizing the interaction of landscape space and indoors of object architecture in a direction from landscape space and vice versa - in direction from building's indoors towards landscape space (Figure 1; TABLE 1; 2).

Context of natural foundation and greenery in Interaction of landscape space and indoors

The Concert Hall is located on the Pasta Island in the city center between the River Lielupe and the River Driksa. The island's natural backdrop, which is surrounded by specific rivers, underwent its revival in 2014 with a major reconstruction. Reconstructed Pasta Island, recognized as the best public outdoor facility in Latvia in 2014. This is evidenced by the victory in the nomination "Public Outdoor Object" of the Latvian Construction Awards 2014 [10]. In the competition "Sustainability in Architecture, Construction, Design 2019" the 2nd place in the Latvian scale was nominated in the nomination "Sustainable Public Outer Space 2019". The designers are "Dianas Zalanes Project Office" and the "Grietens and Kagainis Project Office" [8].

As a result of the reconstruction, significant changes have affected the greenery and the natural base raised to avoid flood risks from the Lielupe in the spring. Throughout history, Jelgava (*Mithava*) has grown around a much larger island, divided into smaller canals by artificial means. For example, the famous Jelgava Castle is built on Castle Island and only a small canal separates it from Pasta Island. Historically, the island complex is considered to be the city center, but nowadays it is an informal center. Castle Island supports two bridges connecting both sides of Jelgava. A few years later, a new open-air concert hall called "Mītava" was opened on the well-maintained Pasta Island. The specific factors make it possible to claim that the concert hall was created in the heart of the city, underlining its importance geographically. In line with existing and prospective major environmental user mobility habits, key viewpoints to the concert hall (A; B; C; D; E; F; G; H; I; J; K; L; M) have been selected,
which are further analysed in the study. The new greenery on Pasta Island, Cakste (*Čakstes*) Boulevard and Promenade has not yet reached maturity in size, which also influences the interplay between the architecture, indoor and landscape space of the investigated concert hall, putting it in perspective (Figure 1; TABLE 3; 4). preserve old tree plantations.

Psycho–emotional nature of spatial synthesis under the influence of natural and artificial light distribution.

Analyzing the importance of natural and artificial lighting in the interaction of landscape space and indoor space in the architecture of the open-air concert hall "Mītava", it is necessary to emphasize the wide variability of external conditions in the

rhythms of the day and season in Latvia. The long twilight hours of day and night alternation, the four seasons with different lighting and the changing meteorological weather affect only one aspect. In addition, artificial lighting produces a complex set of influencing factors (Figure1; TABLE 5; 6).

*Fig. 2. Open-air concert hall "Mītava" in the landscape area, viewing from the pedestrian bridge "Mītava" (View line **A**) [photo created by the author, 2019]*

*Fig. 3. Open-air concert hall "Mītava" in the landscape area (View line **B**) [photo created by the author, 2019]*

*Fig. 4. Open-air concert hall "Mītava" in the landscape area (View line **C**) [photo created by the author, 2019]*

*Fig. 5. Open-air concert hall "Mītava" in the landscape area (View line **D**) [photo created by the author, 2019]*

*Fig. 6. Open-air concert hall "Mītava" in the landscape area (View line **E**) [photo created by the author, 2019]*

*Fig. 7. Open-air concert hall "Mītava" in the landscape area (View line **F**) [photo created by the author, 2019]*

*Fig. 8. Open-air concert hall "Mītava" in the landscape area (View line **G**) [photo created by the author, 2019]*

*Fig. 9. Open-air concert hall "Mītava" in the landscape area (View line **H**) [photo created by the author, 2019]*

*Fig. 10. Open-air concert hall "Mītava" in the landscape area (View line **I**) [photo created by the author, 2019]*

*Fig. 11. Open-air concert hall "Mītava" in the landscape area (View line **J**) [photo created by the author, 2019]*

*Fig. 12. A view from the Open-air concert hall "Mītava" indoor of the urban landscape (View point **K**) [photo created by the author, 2019]*

*Fig.13. Open-air concert hall "Mītava" indoor of the urban landscape (View line **L**) [photo created by the author, 2019]*

*Fig. 14. A view from the Open-air concert hall "Mītava" indoor of the urban landscape (View point **M**) [photo created by the author, 2019]*

TABLE 1

Interaction of landscape space and indoors under the influence of visual perception.
View lines from landscape space to architecture [created by the author, 2019]

Serial No.	View marking and direction	Visual distance	Distance traveled	Description of results
1.	**View line A** (Fig. 2) is the highest view line as it passes through the pedestrian bridge "Mītava", from the Driksa`s shoreline to Pasta Island to the skating rink.	~200—250 m	~120 m	The elevation of the pedestrian bridge shows the ambitious volume of the concert hall "Mītava" in the cityscape space with its proportions and milk-white, light-reflecting and translucent roof membrane. The building resembles a shell in a stylized way, organically inscribing itself on the Pasta Island and adjacent landscaping space. The presence of the Driksa river, which opens up a wide range of visually spatial accessibility, accentuates the size of the building. Open-air facade shields cover the concert hall's interior view.
2.	**View line B** (Fig. 3), following south on the main representative path of Pasta Island from the children's playground in the north to the concert hall.	~50—150	~100	Reveals the dominance of the volume and color solution of the concert hall in the landscape space. The harmonious view is obstructed by the large temporary tent, which is permanently located on the left side of the concert hall. Similar color solutions merge the two buildings into one, creating a visually disharmonious overall volume. Disharmony is enhanced by the degenerate territory adjacent to the concert hall, which joins the left bank of the Lielupe river. The concert hall's interior delicately communicates with the landscape when the entrance shields are raised.
3.	**View line C** (Fig. 4) is the lowest line of view, moving from the lawn along the sandy beach on the right bank of the Lielupe to the lawn.	~250—500 m	~200 m	The volume of the concert hall is recorded proportionally and harmoniously in the landscape space, the city building with separate peaks in the background, which gives the landscape dynamics. At the forefront of the Pasta Island, the degraded area on the left bank of the Lielupe, with its proportions, severely undermines the visual aesthetics of the landscape. Reinforced by a temporary large-sized tent that stands next to the concert hall for a long time. The interior of the concert hall is not visible due to the distance.
4.	**View line D** (Fig. 5), moving south-east on Lielupes Street along the promenade to Peldu Street.	~250—500 m	~450 m	The concert hall overlooking the Lielupe river opens only behind the degraded area of the Pasta island, which is in the foreground, significantly disturbing the visual aesthetic perception of the landscape space. The interior of the concert hall is not visible due to the distance.
5.	**View line E** (Fig. 6), moving south-east from the railway bridge along the promenade to Peldu Street.	~300—800 m	~600 m	There is a harmonious scenery of Lielupe and Pasta Island with a balanced accent in the center of the island thanks to the size and proportions of the concert hall. City building in the background. So far, brownfields have a negative impact on the quality of the environment. The interior of the concert hall is not visible due to the distance.
6.	**View line F** (Fig. 7), moving northwest along the main island of Pasta Island along the Driksa River to the Concert Hall.	~50—450 m	~400 m	On the view line, behind the voluminous formations of sand sculptures, the light building volume of the concert hall reads partly, in the background, the 4-5-story building of Jelgava City on the left shore of Driksa, the dominant of the Trinity Church Tower, and the expressively curved pedestrian bridge "Mītava" over the river. Visual balanced landscape space. As they move closer, a part of the concert hall adjacent to the Driksa river is revealed. On the left side of the drivel, looking back, an unkempt, degraded environment with aggressive building volumes of Jelgava Prison, swimming pool, etc. in arbitrarily grown plants. The interior of the concert hall is visible as it approaches the building and organically moves from the landscape room into the interior, thanks to selected stone materials and plantings that visually merge the spaces and make the entrance gradual and harmonious.
7.	**View line G** (Fig. 8), moving east on Raina (*Raiņa*) Street from the Forest Faculty building to the Driksa River.	~100—250 m	~150 m	In the cityscape space, approaching the intersection of Cakstes (*Čakstes*) Boulevard and Raina (*Raiņa*)Street, the corner of the street reveals a strong volume of construction, highlighted by its light-skinned and curved wooden structures that feature the hinges. The concert hall interacts with the landscape space, opening slightly to each other.

CONTINUATION TABLE 1

Serial No.	View marking and direction	Visual distance	Distance traveled	Description of results
8.	**View line H** (Fig. 9), following J. Cakste (*Čakste*) Boulevard from Lielā Street in a south-east direction to Raina (*Raiņa*) Street.	~100—450 m	~500 m	From the intersection of *Lielā* Street you can see a dynamically shaped landscape space with two accents: the pedestrian bridge "Mītava" and the open-air concert hall "Mītava", which are in visual balance with each other underlining each other. It is united by a similar form of language, expressed in curved forms and cable structures. Moving past the pedestrian bridge, the spectacular proportions of the concert hall and the play of the lights in the light roof covering resonate with the sky and the water. The interior of the concert hall is not visually visible due to the open shields on the facade.
9.	**View line I** (Fig. 10**),** moving from the extension of *Palīdzības* Street along the south-west coast of the Driksa River to the ditch.	~500—600 m	~150 m	Visually high quality landscaped space. The view from the untreated, degraded area at Jelgava Prison stretches across the River Driksa to the landscaped Pasta Island with its bright concert hall construction. The interior of the concert hall is not visible due to the distance.
10.	**View line J** (Fig. 11), following Peldu Street in a western direction to the promenade. River Lielupe.	~250—700 m	~450 m	Initially, there is a severe disharmony consisting of a six-story, high-rise business incubator building with gray concrete finish on the right of Peldu Street, a relatively small, bright orange building on the left, and a curved concert hall on the middle of the island. Moving closer to the concert hall, as soon as the business incubator building is behind you, the landscaping space gets balanced. The interior of the concert hall is not visible due to the distance.

TABLE 2

Interaction of landscape space and indoors under the influence of visual perception.
View points from indoor to urban landscape [created by the author, 2019]

Serial No.	View marking and direction	Visual accessibility distance	Angle of view	Description of results
1.	**View point K** (Fig. 12), looking from inside the landscape area north-west.	līdz ~300 m	>90 °	The view is covered by the armoured facade panels, but behind them is the curved silhouette of the pedestrian bridge, the enclosed rink, and the building of the 4-5 floors of Boulevard (*Čakstes bulvāris*). In the distant viewlines, you can read the silhouette of the Holy Trinity Tower. In general, a proportionally balanced composition consisting of harmonious interaction between the landscape and the interior.
2.	**View point L** (Fig. 13), looking from inside the landscape area in the north-east direction, partially shielded by exposing facade panels.	līdz ~400 m	>90 °	The open area of the facade shows the area of the *Pārlielupe* with the right promenade of Lielupe, the relatively aggressive business hatchery building and the scarlet orange-finished small-floor building beside it. In spite of the considerable distance, the interaction between landscape and indoor is a disco, caused by a strongly aggressive accent, the existing business incubator building in its existing shape and finish. The specific situation offers ample opportunities for investors to build harmonious and high-value buildings on the right coast of Lielupe, which would bring the necessary balance into the building and landscape area as a whole.
3.	**View point M** (Fig. 14**),** no an indoor view of the landscape area in the south-west direction is partly obscured by exposing facade panels.	līdz ~500 m	<90 °	A view of the picturesque bend of the river Driksa, whose left coast is adorned with a cluster of trees, hiding the visually chaotic building of Soviet time, but a well-designed slope of the Mail Island with a lawn. The picturesque silhouettes of sand sculptures stand out. Annually, changing sculptures in the foreground, thanks to the traditional sand-sculpture festival, make landscape space vibrant and interesting. A strong accent with its building size is the nearby swimming pool building on the opposite, right coast of the river Driksa.

TABLE 3

Context of natural foundation and greenery in Interaction of landscape space and indoors.
View lines from landscape space to architecture [created by the author, 2019]

Serial No.	View marking and direction	Description of results
1.	**View line A** (Fig. 2)	In the far-away view, plantations of large leaf trees and Coptic grasslands on the river slopes are visible, supplemented with ornamental shrubs, grasses and bright plantations of summer flowers. On the right side of the concert hall, ornamental plantings (*hemerocallis citrina, spirraea x cinerea, abelia mosanensis, weigela Florida, miscanthus sinensis, hemerocalis hybrida and others*) in a rounded triangular bed. In the close line of view, a bright accent in the lawn sector opposite the silhouette of the concert hall – colours bright flower beds with seasonal flower (*begonia*) plantations created in a stylised number of 100 forms, celebrating the Latvian State's hundredth year with red white flowers, symbolically plotting the Latvian State flag.
2.	**View line B** (Fig. 3)	On the left side of the road, a cluster of large old willows that have managed to preserve during the redevelopment of the Mail Island. The paving cover leads past a concert hall, in the foreground of the Concert Hall, a spacious, well-fitted lawn in a grille and a rounded triangle-shaped boulder covering with small plantations of ornamental trees. Rectangular containers in rust are installed at the concert hall itself, resonating harmoniously with the elegant wooden structures of the concert hall. Seasonal flowers and plants are growing in containers. For example, at the beginning of summer, they were adorned with mottled pansies, and at the end of summer, bright pink peunias, white-faced (*petunia*) and beautiful nuptials (*coleus blumei "Wizard Velvet Red"*). A bright and aesthetic color accent, thanks to flower plantings, underscores the themes of the concert hall's entrance and merges the indoor with landscape space harmoniously.
3.	**View line C** (Fig. 4)	The most powerful theme is the presence of the river, with the movement of water in its shapes the diverse slopes of white sand grown in sectors by lawns. In view across the river, the concert hall is partly covered by a swirl of small willows growing from a boulder area raised from the cobblestone, divided parallel to the river into six small subgroups (*salix acutilifolia* 9 pieces*, salix caspica* 24 pieces*,* *salix cinerea "Tricolor"* 6 pieces*, salix cinerea "Tricolor"* '4 pieces*, salix rosmarinfolia* 8 pieces 2 subgroups) and helps to record the construction volume of the concert hall organically into the landscape room. The chain of plants behind the moulding plant has been extended by the following willow varietal plantings (*salex rosmarinfolia* 8 pieces*, salix caspica* 8 pieces*, salix acutilifolia* 4 pieces*, saliz acutifolia* 6 pieces*, saliz caspcia* 9 pieces*, salix rosmarinifolia* 12 pieces) The extension is divided by the carex (*carex* 50 pieces) plantings in a semi-circular bed. In general, the areas created by the foliage of the trees could be even larger in the landscape area at a given moment.
4.	**View line D** (Fig. 5)	There are separate clusters of blacknaled trees (*alnus glutinosa*) on the right shore lawn of Lielupe, and the long view line shows the large leaf trees on the Pasta island that have managed to be preserved during reconstruction. A number of new plantings of trees and shrubs (*salex, cornus, spiraea and others*) complement the clusters of plush trees. The strongest of the themes in the landscape space in the particular pivot is Lielupe
5.	**View line E** (Fig. 6)	There is a harmonious landscape of the Lielupe water body and the Mail Island, which highlights a picturesque sand beach in a particular direction, and the role of lawned waterfronts in integrating exclusive architecture into the landscape. Landscape spaces are decorated separately with clusters of leaf trees and a raised boulder area parallel to a river-growing surface of low willow (*salix acutilifolia, salix caspica, salix cinerea "Tricolor", salix rosmarinfolia*).
6.	**View line F** (Fig. 7)	The front of the concert hall is decorated with plantations of ornamental shrubs (*spiraea x cinerea, weigela Florida, abelia mosanensis, hemerocallis citrina, hemerocallis hybrida, miscanthus sinensis and others*) in a rounded triangular bed and bright summer flower containers. The slope of a flat lawn visually involves the waters of the river Driksa and the clusters of large trees growing on its left along the accompanying line of views. In close viewlines, an occasional bed of ornamental shrubs and tree plantings in a plump triangular lawn in front of a concert hall has been arranged in landscape spaces. The most powerful color accent is the plantations of bright-flowering (*petunia*) and skaistnātru (*coleus*), which are placed in rust-colored containers along the facade of the concert hall, underscoring the wood structures of the concert hall in volume and design according to color.
7.	**View line G** (Fig. 8)	The architecture of the concert hall is underlined with bright accents produced by ointments (*petunia*) and plants (*coleus*) adjacent to containers. The composition looks well against the backdrop of the lawn growing on both shores of the river Driksa. Natural stone supporting walls used in indoor and landscape spaces play a synthesizing role between indoor and landscape spaces.

CONTINUATION TABLE 3

S. No.	View marking and direction	Description of results
8.	**View line H** (Fig. 9)	Clusters of large leaf trees and Coptic grasslands on both sides of the river Driksa are visible in the far view. On the left side of the drivel, the steep slopes with grasslands are complemented by ornamental shrubs, grasses and bright plantations of summer flowers. The right side of the drivel is more mellowed, lined with lawn and garnished by a bright accent – colored flower beds with seasonal flower (*begonia*) plantations created in a stylized number of 100 shapes, and arranged in the red, white, red colors of the Latvian flag as a flag draped over the number.
9.	**View line I** (Fig.10)	A degraded area saturated by arbitrarily growing trees and shrubs, with future opportunities, opens a line of view across the river Drika to a concert-hall architecture that contrasts with its light volume on the backdrop of landscape space and Mail Island lawn. On the left shore, growing clusters of leaf trees on one side visually complement the building and record it more organically in the landscape space. In the autumn, the landscape space provides additional golden rusty shades. In a period when leaf trees lose leaves, the situation becomes more visually critical, exposing a visually chaotic build-up of Soviet time.
10.	**View line J** (Fig. 11)	The individual clusters of trees on both sides of Lielupe play an important role in the harmony between architecture and landscape space, but their abundance is insufficient. In a period when leaf trees and shrubs lose leaves, the situation becomes more visually critical.

TABLE 4

Context of natural foundation and greenery in Interaction of landscape space and indoors.
View points from indoor to urban landscape [created by the author, 2019]

S. No.	View marking and direction	Description of results
1.	**View point K** (Fig. 12)	The presence of plants through shields is not clearly visible, but the presence of large leaf trees on the coast of the river Driksa is clearly discernible and, with its volumes of green foliage, plays an important role in the synthesis of harmonious landscape space and indoor space, as are the growing, yet small, ornamental plantations of the concert hall. Autumn brings the warm shades into the interior of the concert hall, changing the shades of foliage. The presence of bright flowering petunia (*petunia*) and skaistnātru (*coleus*) plants, located in containers along the front of the concert hall and juicy greens of forest wines (*parthenocissus*) rising along the grey stone walls, are essential in the close viewlines, which ignite fire in reddish shades in the autumn.
2.	**View point L** (Fig. 13)	In the distant line of views, a cluster of large leaf trees across Lielupe appears between the building, which amplifies harmonies in existing buildings. The close viewlines are softened by the low ball-shaped ornamental clusters of willow (*salix acutilifolia, salix caspica, salix cinerea "Tricolor", salix rosmarinfolia*) drawn on the left coast of Lielupe near sand beach. In the fall, the color palette of landscape space shifts from greens to golden-brown shades.
3.	**View point M** (Fig. 14)	A picturesque bend of the river Driksa in the confines of large leaf trees on one side and a tended lawn on the other makes the particular pivot the most raucously harmonious thanks to plantations of bright pink and purple petunia flowers (*petunia*) and (*coleus*) in rusty containers at the side entrance of the concert hall.

TABLE 5

Psycho–emotional nature of spatial synthesis under the influence of natural and artificial light distribution.
View lines from landscape space to architecture [created by the author, 2019]

S. No.	View marking and direction	Description of results
1.	**View line A** (Fig. 2)	*Evaluation of compositional application of colour, light and shadow impacted by sunlight:* in the landscape area, the white coating of the concert hall works as a strong accent, reflecting in the sunlight, thanks to the shape of its flat dome. The indoor area is in deep shadows and in strong contrast with the light coating of the concert hall, without any communication with the landscape area. In days when overcast, the structure of the concert hall is dimming, the shape of the interior can be seen from the bridge. *In the dark hours of the day:* thanks to artificial lighting, which consists of alternating colored headlights from the interior, the extensive coating of the concert hall takes a colour-changing shape and brings the glow of the festival to the landscape area. During the events, the visual presence of the interior of the concert hall is highly visible in the landscape area, thanks to the special effects created by artificial lighting, creating harmonious landscape spaces and indoor synthesis.

CONTINUATION TABLE 5

S. No.	View marking and direction	Description of results
2.	**View line B** (Fig. 3)	*Evaluation of compositional application of colour, light and shadow impacted by sunlight:* he landscape area breaks out a white coating part of a concert hall which, thanks to its curved form, forms a powerful game of sunshine. Indoor in sunny weather is relatively in the shadows, but in the particular direction, which is considered to be the main theme of the entrance, based on its localisation in the landscape area, well-perceived indoor spaces, which significantly expands the indoor landscape and increases the mutual impact of spaces to the extent that indoor and landscape space flows freely into one another. *Evaluation of the usage of visual accents created by chiaroscuro play:* the specific nature of the roof coating material in the light of sunlight causes radiant reflections which act as an accent, strategically speaking in the theme landscape area of the entrance of the concert hall. In days when overcast, the coating of the concert hall is dimming, while more active communication is made by an indoor landscape area. *In the dark hours of the day:*under the influence of artificial lighting, which consists of coloured indoor spotlights, the extensive coating of the concert hall takes a colour-changing shape and brings a glow to the landscape room. Dduring the events, the indoor concert hall is highly readable in the landscape area, thanks to the special effects created by artificial lighting.
3.	**View line C** (Fig. 4)	*Evaluation of compositional application of colour, light and shadow impacted by sunlight:* in the landscape area of the landscape, the white volume of the concert hall stands out as it looks across the water tank of Lielupe, which has been painted in sunny weather in the water. Indoor distance and parking areas do not make communication with the landscape in practice. *Evaluation of the usage of visual accents created by chiaroscuro play:* the specific nature of the roof coating material in the light of sunlight causes a radiant reflectance that acts as an accent, strategically highlighting the concert hall throughout the landscape area of Jelgava, Pasta island and the relevant Lielupe fragment. In the days of overcast, the volume of the concert hall almost converge with the landscape. *In the dark hours of the day:* thanks to the artificial lighting resulting from changing coloured spotlights from the interior, the construction volume of the concert hall is well visible from the *Pārlielupe*, bringing a strong accent and festive glow to the landscape. During the events, what is happening in the interior of the concert hall with the lighting of the spotlights is partially visible across the river.
4.	**View line D** (Fig. 5)	*Evaluation of compositional application of colour, light and shadow impacted by sunlight:* looking across the water tank of Lielupe, which is richly decorated in the water during the sunny weather, the light construction volume of the concert hall reads well, despite its considerable distance. Inindoor distance and parking areas do not create communication with landscape. *Evaluation of the usage of visual accents created by chiaroscuro play:* the specific nature of the roof coating material in the light of sunlight causes radiant reflections, acting as an accent, by lifting the concert hall on the Isle of Mail and the corresponding fragment of Lielupe in the background landscape area. In the days when overcast, the construction volume of the concert hall almost converges with the landscape area. *In the dark hours of the day:* under the influence of indoor artificial lighting, the construction volume of the concert hall is visible from the *Pārlielupe* and brings a joyous mood to the landscape area. During the events, due to the highlighting of the spotlights, the distance from the interior of the concert hall is partly visual across Lielupe.
5.	**View line E** (Fig. 6)	*Evaluation of compositional application of colour, light and shadow impacted by sunlight:* in the landscape area *Pārlielupe* of the landscape, looking across the Lielupe water tank from the level of view of the promenade (**view line E** medium is several metres above the **view line C** level of views), in sunny times the games of shimmering bluegrass in the river water, but the most powerful accent in the landscape area is the white concert hall construction. Volume. Indoor space is under intense shading and communication with landscape space is practically not developed. *Evaluation of the usage of visual accents created by chiaroscuro play:* the specific nature of the roof coating material in sunlight and visual levels creates a radiant reflectance, revealing a significantly larger coverage area of the concert hall than the **view line C**, which acts expressively as an accent, strategically highlighting the concert hall throughout the landscape. In the days when the volume of the concert hall is overcast, the radiance of the landscape space is lost. *In the dark hours of the day:* due to the artificial lighting resulting from changing coloured spotlights from the interior, the construction volume of the concert hall is well perceived from the *Pārlielupe*, bringing the landscape into the room a vibrant glow of color. During the events, the illumination caused by the indoor spotlights of the concert hall is slightly visible from the promenade.

CONTINUATION TABLE 5

S. No.	View marking and direction	Description of results
6.	**View line F** (Fig. 7)	*Evaluation of compositional application of colour, light and shadow impacted by sunlight:* in the landscape, behind sand sculptures, the construction of a concert hall with a relatively thin white-shimmering part of the coating, which, thanks to its curved shape, forms a game of sunshine. From the outermost viewpoint, the indoor area is not visible, but when approaching the concert hall, the indoor area is in the shadows at sunny times, but the landscape space behind the concert hall is also well perceived in the concrete direction through the indoor area, which significantly expands the indoor landscape and increases the mutual impact of the rooms to the extent that the indoor and landscape space flows freely the other one. *Evaluation of the usage of visual accents created by chiaroscuro play:* the specific nature of the roof coating material in the light of sunlight causes radiant reflections, acting as an accent, strategically highlighting the construction volume of the concert hall in the landscape area. In days when overcast, the coating of the concert hall is dimming, while more active communication is made by a landscape space with a landscape space behind the concert hall, looking through the interior. *In the dark hours of the day:* under the influence of artificial lighting consisting of indoor spotlights, the visual visible band of the curved coating of the concert hall shall obtain a colour-altering silhouette.
7.	**View line G** (Fig. 8)	*Evaluation of compositional application of colour, light and shadow impacted by sunlight:* in the urban landscape area, the white concert hall coating works as a strong accent, looking across the river Driksa to the Pasta island, which, thanks to its flat-dome form, reflects the sun-light game. The indoor area is heavily shaded in sunny weather, but it is partly connected with landscape space. *Evaluation of the usage of visual accents created by chiaroscuro play:* the roof coating creates a gleaming reflection which acts as a high accent by striking the construction volume of the concert hall on the visual extension of Raina (*Raiņa)* Street. When overcast, the coating of the concert hall becomes visually inactive, but there is a relatively more active interaction between indoor and landscape spaces. *In the dark hours of the day:* with artificial lighting, the construction volume of the concert hall becomes an active centre of Raina Street. The interior of the concert hall is also visually exposed to the landscape area during events, bringing urban festivals outside the borders of the concert hall across the river Driksa on *Čakstes* Boulevard and partly Raina Street.
8.	**View line H** (Fig. 9)	*Evaluation of compositional application of colour, light and shadow impacted by sunlight:* in future views, the structure of the concert hall is barely visible behind the elegant curvature of the "Mītavas" Bridge, moving closer to the concert hall along the Bridge, a strong accent entering the landscape area consisting of the expressive air-moon games of the large-span roof of the concert hall. The indoor area is shaded in sunny weather, and the overview is covered by awny wind panels. *Evaluation of the usage of visual accents created by chiaroscuro play:* the roof coating of the concert hall creates a shimmering reflectance which acts as an accent on the well-fitted Cakstes boulevards, the reflection of the waters of the river Driksa in the sun and the background of the Pasta island. When overcast, the volume of the concert hall and the indoor landscape area are visually passive. *In the dark hours of the day:* with artificial lighting, the construction volume of the concert hall becomes one of the main sites illuminated in the landscape area alongside the Railway Bridge, the "Mītava" Bridge, the "Silva" Tea House, the lighthouse and other highlighted objects on land and water. The interior of the concert hall is also visually exposed to the landscape area during events, bringing festive lights outside the borders of the concert hall across the river Driksa on the Cakstes Boulevard.
9.	**View line I** (Fig. 10)	*Evaluation of compositional application of colour, light and shadow impacted by sunlight:* the area overgrown by trees and shrubs allows only visual reception of the curved light concert hall construction volume, which rises across the river in the Pasta island landscape area thanks to sunlight. The indoor is not visible. *Evaluation of the usage of visual accents created by chiaroscuro play:* the roof coating of the concert hall creates a luminous reflectance that glinks in the distance behind the trees. Ehen overcast, the indoor is not visible. *In the dark hours of the day:* with artificial lighting, the construction volume of the concert hall becomes an accent in the landscape area. The interior of the concert hall is not visually visible due to its proximity and distance.
10.	**View line J** (Fig. 11)	*Evaluation of compositional application of colour, light and shadow impacted by sunlight:* on the road of Peldu and looking across Lielupe, the illuminated white building volume of the concert hall's sunlight games is visual, despite the sheathing of buildings in the landscape of *Pārlielupe*. Indoor distance and shading means that communication with landscape space is practically not developed. *Evaluation of the usage of visual accents created by chiaroscuro play:* the glow of the roof coating in the sunlight significantly reinforces concert halls in the dominantly landscape area on the visual extension of the Peldu street. In the days when the volume of the concert hall is overcast, the radiance of the landscape space is lost. *In the dark hours of the day:* thanks to the artificial lighting resulting from changing coloured spotlights from the indoor area, the construction volume of the concert hall is well-perceived from the trajectory of Peldu Street as a coloured urban accent between the lights of the Lielupe Bridge and the Railway Bridge.

TABLE 6

Psycho–emotional nature of spatial synthesis under the influence of natural and artificial light distribution. View points from indoor to urban landscape [created by the author, 2019]

Serial No.	View marking and direction	Description of results
1.	**View point K** (Fig. 12)	*Evaluation of compositional application of colour, light and shadow impacted by sunlight:* in the particular direction, the direct sunlight affects the indoor areas most in the morning and evening hours, from which the skylines of the urban buildings are particularly drawn in colors in the expressive setting of the sun-induced harmony landscape and indoor interaction. Acoustic panels fortified in different links to the elegant curved wooden structures of the concert hall division under sunlight form a unique and harmonious symphony of air and colors covering the curved ceilings of the large format and reflecting in grey concrete floors and stone supporting wall planes. *Evaluation of the usage of visual accents created by chiaroscuro play:* sunlight playing plays on the adjacent surface of Driksa water reflected in acoustic shields on the ceiling of the concert hall, transforming the room visually from stilled material into a living lightly shimmering organism. In days when the interaction between the overcast, indoor and landscape area is fading. *In the dark hours of the day:* thanks to the artificial lighting caused by the specialised effects of headlights in the indoor area, the landscape space is gradually fading out of sight in front of the activities on the stage as the sun rises and darkness fades. The artificial lighting of the urban environment is shining, which complements what is happening in the indoor environment.
2.	**View point L** (Fig. 13)	*Evaluation of compositional application of colour, light and shadow impacted by sunlight:* in the light of sunlight, the landscape area enters very actively visually into an indoor area under comparative shading. Grey concrete floors and cobblestones, thanks to the shading created by the roof cover structures, produce a weather-changing adornment of light areas that enliven the interior by sunlight. *Evaluation of the usage of visual accents created by chiaroscuro play: s*unscreen coating with light-transmitting properties becomes a high light accent, accompanied by sun-induced variable light accents in all planes of the room. In the days when the indoor and landscape interaction of the concert hall is overcast, the brightness of colors is lost, but, thanks to the light-transmitting capabilities of the cover material, it is nevertheless a 3-D lightness. *In the dark hours of the day:* thanks to the artificial lighting resulting from changing coloured spotlights from the indoor area, the construction volume of the concert hall is well-perceived from the trajectory of Peldu Street as a coloured urban accent between the lights of the Lielupe Bridge and the Railway Bridge. Artificial lighting of the Pasta island is a good complement to what is happening in the interior.
3.	**View point M** (Fig. 14)	*Evaluation of compositional application of colour, light and shadow impacted by sunlight:* the sun communicates with the interior by sunbathing it. In the particular direction, as in **point M**, the acoustic panels on the elegant curved wooden structures of the concert hall division, in the light of sunlight, are a unique pattern of light and colors adorning the curved ceiling and reflecting in floors and wall planes. *Evaluation of the usage of visual accents created by chiaroscuro play:* sunlit areas create a live indoor playing of light; In days of overcast, more active indoor landscape space with the curved silhouette of the river Driksa. *In the dark hours of the day:* landscape and indoor communication on distant viewlines fades with the onset of darkness, as the visible chunk of the left coast of Driksa cannot yet be proud of sufficient illumination. Thanks to the highlighting of the Pasta island, there is a little bit of the artistic presence of sand sculptures in the interior.

Conclusions

Jelgava's urban landscape space has become richer in 2019 with the original, modern construction of large-span curved, glued wooden structures – an open-air concert hall called "Mītava", underscoring the spotlight of harmonious landscape spaces and indoor interaction today. The stylized snail-like structure of a concert hall covered with a milkish, light-reflecting membrane brings a new dominant between two rivers into the existing Pasta island and adjacent areas, visually arranging the urban landscape space. The arrangements and buildings of Chacste Boulevard (*Čakstes bulvāris*) with the silhouette of the Holy Trinity Tower in the background, the new pedestrian bridge "Mītava" and a balanced volume of plantings provide visual and high-quality tendencies. Visual harmony is hampered by a large temporary tent long on the left side of the concert hall, the degraded areas of the Pasta island on the left coast of Lielupe, the aggressive construction of the business incubator on the right of Lielupe and the left-side Jelgava prison area on the left side of Driksa river, the chaotic building of Soviet time alongside it and the outdated facade of the swimming pool directed against the Driksa river. The interior of the concert hall communicates delicately with the landscape area if the entrance shields are both raised and lowered. Visual-quality interaction between indoor and landscape spaces is formed in the direction of Chacste Boulevard, as opposed to the direction of Parlielupe.

The most visually powerful theme of the natural base is the river water movement, the diverse white sand slopes in shapes, and the balanced size and diversity of plants. The presence of large leaf trees on the shores of Driksa river and Lielupe, with their volumes of green foliage, plays an important role in the synthesis of harmonious landscape space and indoor spaces, as do the ornamental plantations growing in the foreground of the concert hall. Autumn brings the warm shades into the interior of the concert hall, changing the shades of foliage. Essential in the close viewlines are the presence of bright flowering petunia and (*coleus*) plants located in containers along the front of the concert hall and the twists of forest wines (*parththenocissus*) rising along the grey stone walls, which ignite fire in reddish shades in the autumn. The close viewlines are softened by the low ball-shaped ornamental willow (*salix acutilifolia, salix caspica, salix cinerea "Tricolor", salix rosmarinfolia*) clusters on the left shore of Lielupe. In the fall, the color palette of landscape space shifts from greens to golden-brown shades, dynamically enriching the space.

In the landscape room, the white coating of a concert hall works like a strong accent, reflecting the sun-influenced game in a flat dome shape, while the interior is in deep shadows and in strong contrast with the bright coating of the concert hall, without having to communicate with the landscape. As the sun relieves, indoor space will be proportionally reinforced, creating a room that interrupts with the landscape. The specific nature of the roof coating material in sunlight causes a gleaming blinding reflection that acts as a visual accent of a large area, strategically highlighting the construction volume of the concert hall throughout the landscape of Jelgava, Mail Island and the relevant Lielupe fragment, while the indoor shapes become visible on days when the overcast, concert-hall structure is dimming. In the dark part of the day, thanks to changing artificial lighting consisting of colored lights on the backs of the building-bearing poles, the extensive coating of the concert hall takes a colour-changing shape. During the events, visual visual visuals in the indoor area of the concert hall can be seen in the landscape area, thanks to the special effects created by artificial lighting, creating harmonious landscape spaces and indoor synthesis.

Direct sunlight affects the indoor areas most in the morning and evening hours, which is particularly driven behind the silhouettes of the urban buildings in colors in the expressively setting sun-induced harmony landscape space and indoor interaction. The acoustic panels fortified in various twists, on the curved wooden structures of the concert hall division, under the influence of sunlight, form a unique and harmonious pattern of light and colors covering the curved ceilings of the large format and reflecting in gray concrete floors and stone-supported wall planes. The sun-generated playing of light on the adjacent surface of Driksa water reflected in acoustic shields on the ceiling of the concert hall, transforming visual space from stillness into a living lightly shimmering organism. The roof coating having light-penetrating properties becomes, in the sunlight, a great bright accent, accompanied by changing light accents from the sun in all rooms in planes. On days when the interaction between the overcast, indoor and landscape space is losing shine. Thanks to the artificial lighting created by the specialised effects of headlights in the interior, the landscape space gradually fades out of sight in front of the activities on the stage, the artificial lighting of the drilling environment, which perfectly complements what is happening in the interior.

The realisation of an artistically stylistic concept in an open-air concert hall called "Mītava", downstream to an existing landscape space, is generally considered to be a valuable contribution to a urban environment. The concrete example underlines the importance of successful interdisciplinary cooperation in harmonious landscape and indoor interaction, opening up new opportunities in the future.

References

1. *Arhitektūra un kultūrpolitika Latvijā* [tiešsaiste]. Latvijas arhitektūras politika 2020 [skatīts 7.02.2020]. https://www.latarh.lv/f/Latvijas%20arhitekturas%20politika%202020_pa%20lapam.pdf
2. *Baukultur un Davosas deklarācija* [tiešsaiste]. Latvijas arhitektūras politika 2020 [skatīts 7.02.2020]. https://www.latarh.lv/f/Latvijas%20arhitekturas%20politika%202020_pa%20lapam.pdf
3. *Brīvdabas koncertzāle "Mītava" atklāta* [tiešsaiste]. Jelgavas pilsēta pašvaldības iestāde Kultūra [skatīts 24.01.2020]. [http://kultura.jelgava.lv/article/brivdabas-koncertzale-mitava-atklata
4. **Grietēna, A.** *Ainavu telpas un iekštelpas mijiedarbe Latvijas izglītības un mākslas ēku arhitektūrā* [tiešsaiste]. Promocijas darba kopsavilkums Arhitektūras zinātniskā grāda (Dr. arch.) iegūšanai ainavu arhitektūras apakšnozarē, LLU [skatīts 24.01.2020]. https://llufb.llu.lv/dissertation-summary/landscapearchitecture/Aija_Grietena_prom_darba_kopsavilkums2019_LLU_VBF.pdf
5. **Grietēna, A.; Ziemeļniece, A.; Īle, U.** The interactivity of the landscape space and interiors in the architecture of the Latvian education and art buildings of the 20th/21st century. *Landscape Architecture and Art.* 2017, V 11, p. 15-22.
6. *Ieraksti 2019.gada 15. jūnijs* [tiešsaiste]. SIA Igate Būve [skatīts 27.01.2020]. https://www.facebook.com/Igate Buve/posts/1475287615946942/
7. *Mītava, brīvdabas estrāde* [skatīts 11.09.2019]. https://www.google.com/maps/search/koncertzale+m%C4% ABtava/@56.652107,23.7247161,804m/data=!3m2!1e3!4b1?hl=en

8. *Noskaidroti konkursa "Ilgtspējība arhitektūrā, būvniecībā, dizainā 2019" uzvarētāji* [skatīts 27.01. 2020]. https://abc.lv/raksts/noskaidroti-konkursa-ilgtspejiba-arhitektura-buvnieciba-dizaina-2019-uzvaretaji-b692fff8fe
9. **Ozoliņš, A.** Ar lapotni debesīs. Kāpēc Latvijā baidās būvēt daudzstāvu ēkas no koka [tiešsaiste]*? LA.LV.* [skatīts 31.01.2020]. https://www.la.lv/koku-baidas-celt-uz-augsu-koka-ekas
10. *Paziņoti konkursa "Latvijas Būvniecības gada balva 2014" uzvarētāji* [skatīts 7.02.2020.]. https://abc.lv/raksts/pazinoti-konkursa-latvijas-buvniecibas-gada-balva-2014-uzvaretaji
11. **Skinner P.** Reflections on Inside-Outside Space [cited 11.09.2020.]. https://espace.library.uq.edu.au/data/UQ_3545/insideoutsidetext.pdf?Expires=1548959072&Signature=ZEAsLcwvV389BveVI5DV5RxFiSqTzRu4-FTzJjLr4ErwSSV1T0jcJgbrsQA~M8OpmPpvUyKaQVEgTIdVYEhFyKwTcBHvO~1ogSyYf05Sl1NjIW09If6EtCrtpYXHM7hDXr1PXhMRUXPZCPmqKK0YN739mQYS-0VDqM84oQfP5YnA3xpbirvNetBWF273ISZ5qWev~vXEmgGtRS1LodavRbNiPTjjFLG4s0mnxcJcpxvOCDI4rYcCbKoUuGs-6pWaEGbFkjtHDW70WuZi7~fOchhJYCB02Ma1KBiEBq3rVgDk-ZI7j3gPLwDPEC7bWXUtBq2PmYK0x7ws66waIHWuvA__&Key-Pair-Id=APKAJKNBJ4MJBJNC6NLQ.
12. **Strautmanis, I.** *Latviskā telpa*. Rīga, RTU izdevniecība, 2011, 157 lpp.
13. **Zigmunde, D.** Estētiskās kvalitātes kritēriji urbanizētas ainavas izpētē. LLU Raksti 25 (320), Jelgava, 2010, 1.– 2. lpp.

AUTHOR:
Aija Grietēna, Dr. arch., certified architect at firm *Grietēns Arhitekti*. Field of research: interaction of landscape space and indoors in architecture. E−mail: aijagrietena@gmail.com

Kopsavilkums. Meklējot līdzsvarojošos faktorus vides veidošanas mākslā starp arhitektūru, ainavu arhitektūru un interjeriem, kas nepieciešami starpdisciplinārā sadarbībā balstītas plānošanas uzlabošanai un vides psihoemocionālās kvalitātes celšanai, tiek turpināts pētījums par ainavu telpas un iekštelpas mijiedarbi, izmantojot salīdzinošās analīzes un induktīvās uzziņas metodes.

Latvijas mērogā jaunas, plašas 21. gadsimta tehnoloģiskas iespējas koka būvkonstrukciju projektēšanā un ražošanā materializējušās brīvdabas koncertzāles "Mītava" arhitektūrā, kas 2019. gadā uzbūvēta Pasta salā, Jelgavā. Unikālas, lielu laidumu, liekti, līmētas koksnes vienlaidu jumta konstrukcija līdz 60 m, atgādina Lielupes krastā izskalotu gliemežvāku. Oriģinālas koka būvkonstrukcijas pavērušas jaunas iespējas ainavu telpas un iekštelpas mijiedarbei, veidojot plašu, savdabīgu telpisku sintēzi.

Mākslinieciski stilistiskās koncepcijas realizācija brīvdabas koncertzālē "Mītava", kas pakārtota esošajai ainavu telpai un papildināta ar atbilstošiem apstādījumiem, uzskatāma par vērtīgu pienesumu urbānā pilsētvidē Baltijas mērogā, pateicoties unikālu lielu laidumu liekti līmētu koka konstrukciju izmantojumam oriģinālā arhitektūrā un harmoniskai ainavu telpas un iekštelpas mijiedarbei. Konkrētais piemērs pasvītro veiksmīgas starpdisciplinārās sadarbības nozīmi harmoniskas ainavu telpas un iekštelpas mijiedarbē.

DOI: 10.22616/j.landarchart.2020.17.08

A biophilic mind-set for a restorative built environment

Thomas Panagopoulos, *University of Algarve, Portugal*
Madalina Sbarcea, *Ion Mincu University of Architecture and Urban Planning, Romania*
Krzysztof Herman, *Department of Landscape Art, Warsaw University of Life Sciences, Poland and Wellington School of Architecture, Victoria University of Wellington, New Zealand*

Abstract. The biophilic design promotes specific principles and patterns of nature-based solutions for health and well-being in the spaces we live and work. A growing body of literature advocates a more prominent role of nature in urban design and architecture, emphasizing the necessity of maintaining, enhancing, and restoring the beneficial experience of nature in the cities. Biophilia and nature-based solutions can improve the quality of built environment design and bring new opportunities to restore urban ecosystems and smart thinking for sustainable cities. The paper concludes that adopting biophilic principles in urban planning will lead to cities that can regenerate life and nurture end-users' health and well-being. Moreover, bring forward ways to transfer human nature ties' knowledge into restorative approaches to design the built environment.

Keywords: restorative design, biophilia, well-being, sustainable city

Introduction

Cities already find themselves in a challenging context facing increasing risks associated with environmental degradation, climate change, aging population, while urban society faces severe inequality and fragmentation [5]. The rapid urban expansion resulted in undesired effects such as the urban heat island effect, air pollution, increased impermeable areas, and human health risks [57]. However, an increasing number of cities and human settlements adopt integrated policies and plans for resource efficiency and climate change adaptation [77]. The importance of urban green infrastructure on human health and well-being has been reported in many studies [66, 88]. These psychological benefits might be related to the so-called biophilia concept. Wilson [89] defines biophilia as the "innate urge of humans to affiliate with nature and other forms of life and life-like processes."

Recognized as a highly relevant factor contributing to the sustainable built environment, biophilic design [44] promotes specific principles and patterns of nature-based parameters that either mitigate stressors or enhance certain qualities like creativity, memory, focus, relaxation, thus improving performance and well-being [76]. The biophilic design emphasizes the necessity of maintaining, enhancing, and restoring the beneficial experience of nature in the built environment. Even is considered an innovative approach, the biophilic concept has been present in how the built environment was designed for much of human history [73].

The recent progress on the design for sustainability in the built environment has not proven efficient in making the transition towards a socially just, ecologically restorative, and culturally prosperous future because it focuses mainly on mitigation of environmental impacts [14]. The regenerative approach to design goes beyond urban development with low environmental impact and towards ecosystem restoration, climate change adaptation, and human health enhancement [59]. A shift in sustainability thinking - from mitigating the environmental impact to regenerative design - has become compelling and even inspiring for the design of bioregenerative life support systems [34]. Similarly, the net-zero strategy should be replaced by a net-positive build environment that gives more than it takes [52]. An increasing number of studies suggest that biophilic principles in the planning, at any scale, will lead to buildings and cities that can support healthy, flourishing communities [4, 53]. Biophilic design and a systems-thinking approach that allows us to take inspiration from nature are required to achieve urban sustainability and resiliency [50].

The purpose of this paper is to gather updated information on biophilic design theory and practice linked with the restorative function of the built environment. State of the art, filtered through the authors' experiences with built environment practice from different regions, identifies challenges and opportunities for the transition from low-impact to net-positive/restorative built environment through biophilic design. The paper also examines the adoption of biophilic principles in urban planning that transfer the human-nature biological bond into specific restorative approaches to design the built environment.

Methodology

This article is an essay on biophilic design for a restorative built environment. It addresses the rise of this alternative manner of approach of managing both the built and natural environment. Some concepts are a few years old and well established but remain very powerful; others are new and provide deeper insights into the sustainability mindset. The intent is not to identify if it is a better approach but to support understanding and explain the development of these ideas.

Fig. 1. Shifting to regenerative design and sustainability thinking (based on [15]

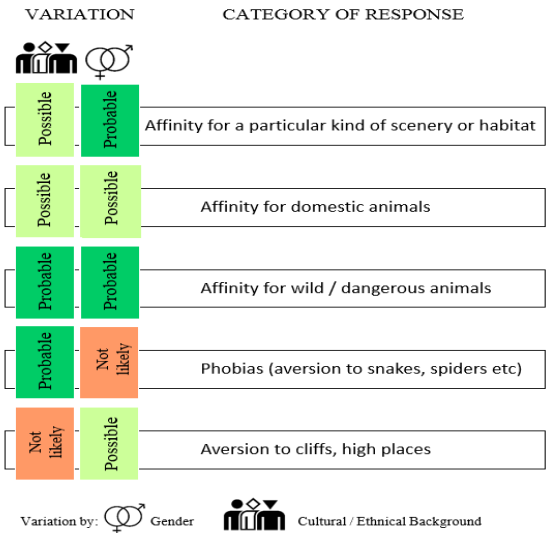


Fig. 2. Correlation between biophilic responses and population heterogeneity (adapted from [82])

This essay is not a detailed explanation of biophilic design, its patterns, and current debates; instead, it explains the origins and rise of biophilic design in a broad sense. The methodology employed in this essay is a method of criticism that is common to the design arts, including architecture and landscape architecture [18]. It is based on a literature review on built environment sustainability thinking developed during the project RESTORE (Rethinking Sustainability Towards a Regenerative Sustainability) [15]. According to RESTORE, restorative sustainability refers to "restoring socio-ecological systems to a healthy state." In contrast, regenerative sustainability moves forward to "enabling socio-ecological systems to maintain a healthy state and evolve." Figure 1 presents the shifting from a "business as usual" linear economy that drives resource depletion to the holistic thinking approach that favors resource regeneration.

Since the Brundtland report published in October 1987 by the United Nations [93], when we promised not to compromised tomorrow's generation, the key sustainability indicators are still heading in the wrong direction. A new mindset and approach are needed, which sees our development as part of the ecosystems. It is necessary to embrace the actions required to address the climate and ecological emergency we are facing.

Biophilia in design and human well-being

Biophilia and Biophilic design

Psychologist Fromm [29] first used the term biophilia and later was promoted by biologist Wilson in his book of the same title. Biophilia is the innately emotional affiliation of human beings to other living organisms, an integral part of human physical and mental growth [90]. For David Orr [63], it is an affinity for life, earth, forests, water, soils, and place. According to Kellert and Calabrese [43], it is the inherent human inclination to affiliate with nature.

Disputes on the biophilia hypothesis have been summarized by Joye and De Block [40]. They challenge the placing of positive human feelings for life in a narrow evolutionary psychology framework and suggest that biophilia theory has overestimated the evolutionary origins of these feelings since it could be a simple enjoyment from contact with nature's harmony. Many research fields contribute with evidence that this human-life-nature bond exists and is beneficial as it provides meaning, enjoyment, and health benefits [24]. Biophilia is regarded as a complex concept that considers different potential influencers of bioresponsive behavioral systems such as gender or ethnic/cultural background. Thus, biophilic responses are not claimed to be based strictly on a universal predetermined genetic structure and incorporate population heterogeneity. Figure 2 depicts such a correlation, as described by biologist Michael E. Soule [80]. The biophilic design could be demarcated as translating this characteristic human affinity into the built environment. At all times, Beatley and Newman [7] were considering the variables stemming from local specificity with the declared purpose of creating spaces that foster human well-being.

Positive effects of biophilic design features

Figure 3 depicts integrating biophilia in designing a place of well-being. Biophilic design brings the valuation of both the natural surroundings and of the built environment that enables it. Summarized by Kellert [45] and with supporting evidence from other researchers, some of the following positive biophilic design outcomes are worth noting:

- Contact with nature has been found to enhance healing and recovery from illness or surgery [2; 31; 86]. Also, to maintain optimal physical and psychological health [9; 37; 78]. Hernández and Hidalgo [36] showed that natural elements in built environments yielded higher mental restorativeness than urban environments lacking these.

Fig. 3. Biophilic urbanism approach in Algarve, Portugal, designing urban space as a place of well-being and reintroducing critical connections with natural systems using native plants, organic shapes, and natural materials [photo: M. Sbarcea]

Fig. 4. Preserving the vernacular architecture of Danube Delta and the sensible relationship with its natural and cultural landscape in the development of touristic facilities [photo: M. Sbarcea]

- People living in proximity to green spaces report more robust health and lower social problems [41]. Green urban infrastructures allow people to benefit from ecosystem services to achieve better health and an overall state of well-being [46, 85]. On the contrary, urban design that does not support and enhance eco-services profoundly affects inhabitants. According to Grinde and Patil [30], some deviations from the way of life for which humans are genetically designed – in this case, the absence of greenery and other natural elements – generate stress, which might lead to various ailments. Furthermore, Birkeland [11], referring to casualties from heat-island effects, stated that "poor urban design kills more people each year than terrorism."
- Workplaces with natural lighting, ventilation, and greenery help increase performance, while employees hold greater work motivation [74]. However, health issues linked with the sick-building syndrome have been diagnosed in workers of buildings that lack these characteristics [75].
- Contact with nature provides better cognitive functions on tasks related to concentration and memory [8; 42].
- Contact with nature provides Healthy childhood development as a state of physical, mental, and social well-being, and not merely the absence of disease [56; 82].
- On the other hand, the suppression of biophilia may lead to nature-deficit disorder among children, regarding the range of behavioral problems children display due to spending less time outdoors [10; 49].
- Communities with higher-quality environments, such as biophilic design features, have a superior quality of life and a stronger sense of place, leading to ownership of their living environments [32; 91].

Towards a restorative / regenerative sustainability paradigm

Within the built environment, most approaches and tools aim to reduce the environmental impact to seek a state of sustainability [15]. Some approaches and tools have recently sought to go one step further and restore socio-ecological systems to a healthy state [47]. However, according to Thomson and Newman [82], emerging strategies go beyond and support healthy systems to evolve and provide a regenerative paradigm. Zhang et al. [94] point out an evident growing interest in regenerative sustainability thinking in academia and practitioners, with slight variations in terminology due to the topic's emerging nature. Peters [68] refers to building for enhancing human well-being based on the biophilia concept: a deep connection with nature. Peters states that the sustainability of the built environment can no longer be enforced as creating harm-minimizing structures, but orienting the built environments' design towards generating definite advantages for the socio-ecological systems they are part.

The sustainability in urban design is based on habitat plants and regenerative landscape design. Cole [20] presented a comprehensive review of the conceptual underpinnings of "Green design," "sustainable design," and "regenerative design." He analyzed the implications emerging from shifting from green to regenerative design. Meanwhile, Ceschin and Gaziulusoy [19] provided an overview of the historical evolution of design for sustainability and demonstrate that it has progressively expanded from a technical and product-centric focus to a system-level change. In this change, sustainability is understood as a socio-technical challenge.

Re-establishing traditional design practices, rooted many times in indigenous and vernacular solutions, may inspire reinterpretation into a contemporary context (Figure 4). Vernacular buildings are often

Fig. 5. An indoor garden in Singapore Changi Airport is designed to relax and enhance people's positive relationship with nature, even inside a crowded terminal [photo: T. Panagopoulos]

Fig. 6. A biophilic pool in Albufeira, Portugal, was designed for swimming in contact with nature while avoiding allergies from pool chemicals due to water purification using plants [photo: T. Panagopoulos]

characterized by inherent qualities, such as natural ventilation, that make it possible to convert them into energy-efficient buildings [27]. Ramzy [73] revealed that one reason behind the great admiration that most people have for old buildings is the biophilic qualities found in these buildings.

Sustainable design has a high potential to engage and maintain stakeholder commitment and establish common grounds with different stakeholders, altering designers' responsibilities and skills to position themselves within a whole system framework [27]. In the glossary presented by Mang and Reed [51], restorative environmental design is defined as a “design system” that returns polluted, degraded, or damaged sites back to a state of good health through biophilic design interventions that reconnect people to nature. However, biophilic design's restorative effect focuses mostly on people. Hidalgo [38] acknowledges both environmental issues and the psychological effects of nature on human well-being but focuses mainly on how biophilic environments can provide psychological restoration.

The biophilic design addresses the importance of restoring and enhancing people's positive relationship to nature in the built environment, as in the indoor settings visible in Figure 5, busy airport terminal. Unfortunately, the current research and practice approach has focused almost exclusively on minimizing the built environment's impact on natural systems.

To reach true, long-lasting sustainability, restorative environmental design, and biophilic design must support each other in mutual relation. According to Prasad [72], the current approaches are grounded in a mechanistic worldview and reductionist thinking, which attempt to mitigate the built environment's deteriorating consequences on human health and ecological systems. Meanwhile, according to DuPlessis and Brandon [25], an ecological worldview might set the premises for a regenerative sustainability paradigm, focusing on strengthening the health, the adaptive capacity, and the evolutionary potential of the urban socio-ecological systems. Along these lines, scholars are theorizing alternatives to an anthropocentric understanding of human-nature relations. Humans are part of, not separate from, ecosystems. Therefore, rendering biophilic approaches in planning and design is increasingly important for achieving the restorative and regenerative potential of the built environment.

Describing biophilia as a design philosophy that is relational in its approach, Mang and Reed [51] deem it "somewhat passive in its engagement with life and anthropocentric in its purpose." The basic concept is exploring human preference for living systems and their processes and positively influence human health and well-being through specific biophilic techniques. Figure 6 shows a case of biophilic design at an eco-friendly and cost-efficient swimming pool with healing and regenerative purpose.

Nevertheless, Tidball [84] introduced the concept of "urgent biophilia" as the urge expressed by humans (individuals and communities) to seek post-disaster interaction with nature as a support to adapt after a crisis. The embedded affinity humans have for the rest of nature and the need to express it by creating healthy environments can confer resilience across multiple scales in socio-ecological systems. These pursued doses of nature go beyond only nature contact but encompass active engagement in restoring nature in the community, for example, through urban community forestry and community gardening [1]. Furthermore, Panagopoulos et al. [67] acknowledge that the increase in urban agriculture in many European cities has been part of a response to a global crisis, attesting to the resilience of the people living in cities.

Challenges for restorative sustainability thinking and practice

Biophilic design is translating biophilia into built environment planning and supporting its regenerative attributes by restoring community and ecological health and enabling complex systems to maintain health and further evolve [12]. In terms of making the transition towards a regenerative future, biophilic design is an essential element of an integrative system holistic design approach. We bring forward some considerations on the status-quo in built environment sustainability practice that can serve for a better understanding of the potential for making the shift towards restorative and regenerative sustainability with the support of biophilic approaches:

Changes in climate and demography. Designing the built environment was based on historical data about climate, assuming that it is stable. Meanwhile, there is growing evidence that the climate is changing, the population is growing and aging, and migration is increasing [61]. Adaptation to those changes with new infrastructure will imply high costs and city life disturbance [23]. Designing cities based on the biophilic urbanism concept, implementing nature-based solutions in urban areas, and providing more ecosystem services due to an increase of urban green infrastructure and may provide a cheaper solution that simultaneously improves the quality of life and, even in extreme climates, enhance resilience and capacity for regeneration [68].

Transfering the human-nature biological bond into the design of the built environment. The growing body of research from neurosciences, endocrinology, and other fields have helped evolve the scientific basis for biophilic design. From the framework proposed by Cramer and Browning [21], comprising biophilic attributes were grouped in conceptual categories such as nature in space, natural analogs, and nature of the space. This growing knowledge is only partially articulated in architectural terms' emerging design parameters [55]. There is still a stringent need for further research to improve understanding of biophilic design patterns and capture the positive psychophysiological and cognitive benefits imprinted by biophilia on design interventions. Simultaneously, transdisciplinary and interdisciplinary approaches and systems thinking, and a multi-scale approach are brought forward as essential premises for imprinting a sustainable development direction for the human habitat [70].

Integration of technological and ecological sustainability within architectural/engineering practice. Few architects and engineers are familiar with or trained in an ecological paradigm [6]; meanwhile, ecological design competence requires ecological knowledge about how nature works. Although, as Orr [62] notes, ecological problems emerge from human action and can be assimilated to design problems, as our designed products are not compatible with the biosphere. That is why rethinking and reshaping design to enable compatibility with our natural environment is paramount. Biomimetics offered opportunities for addressing this challenge. Biomimicry or Ecomimesis design philosophies look to nature as inspiration. They leverage a functional approach that uses nature - its forms and its processes - as a model for humans to follow [92].

Key influencers and motivators that can replace the "business as usual" sustainability with restorative sustainability. Sustainable building certification standards are essential influencers on the built environment and the commercial and industrial sectors and even on building occupants' lifestyles [3]. That is why these standards need to push for greener building certification, making a case for reconstructing the world of sustainable building standards. Established certification standards such as BREEAM, LEED, and Green Star are rooted in an energy-environment-economics paradigm. They are valuing energy performance and avoid damaging the environment within economic boundaries. New standards such as the Living Building Challenge and WELL building standard emerged from a restorative paradigm that strives to represent, at the same time: philosophies based on a set of ecological or health values; advocacy tools for promoting a better way of addressing the design, construction, and operation of buildings; a building certification or recognition-of-achievement scheme [14], which means more holistic, more integrative and taking more into account the benefits of green and natural features for regenerative sustainability.

Regulate greenwashing practices that might create an impact on environmental and human health. According to Dahl [22], greenwashing is the practice of making unwarranted or overblown claims of sustainability or environmental friendliness in an attempt to gain market share. Action is being taken in this sense worldwide by advertising regulatory bodies with the scope of discouraging greenwashing practices.

Ensure a sustainable public procurement policy context. Many architecture/engineering practitioners worldwide note that one of the worst impediments to build sustainably is the lowest-cost procurement mindset. It has negative consequences on the quality of the entire design/construction process. Cost/benefit analysis that includes the environmental and the social benefits will attenuate this impediment and the use of indicators from an ecosystem services assessment approach. Furthermore, the financial gain derived from biophilic features in the built environment has been proven and quantified to some extent [16].

TABLE 1

Challenges and opportunities for shifting to restorative sustainability thinking / design [created by authors]

Challenges and limitations	**New approaches and opportunities**
Climate is changing.	Adaptation using nature-based solutions and mitigation by green infrastructure enhancement.
Demographic changes due to the ageing population and migrations.	Environmental justice with urban planning for equal access and accessibility to benefits from green infrastructure.
Product-focused engineering perspective due to limitation of our ability to transfer the understanding of human-nature biological bond into specific approaches for designing the built environment.	Biophilic design in multidisciplinary teams using transdisciplinary and interdisciplinary spatial-social, and socio-technical system approaches to understand the patterns of relationship in living systems.
Reconciliation of the technological and ecological sustainability within architectural/engineering practice.	Biomimicry or ecomimesis as design philosophies that look to nature as inspiration.
Greenwashing and the "business as usual" paradigm.	Key influencers and motivators that can replace "business as usual" low environmental impact sustainability with restorative sustainability.
Ensuring the proper policy and practice context	Ecosystem services in development policies; Green and sustainable public procurement; Tools for restorative and regenerative sustainability; Integration of circular economy supporting principles.
Slow learning loop.	Early education for regenerative sustainability in a co-design and co-creation process.
Low public engagement at all levels	Integration of participatory approaches at the early stages of design and decision making.
Lack of motivation from built environment developers/policymakers	Highlighting potential economic benefits, together with environmental and socially positive outcomes.

Sets of tools for Restorative and Regenerative Sustainability. While making the transfer from theory to practice may be challenging, specific tools and frameworks have been developed to assist this process. Among these, the United States Green Building Council brought forward LENSES and REGEN to provide a clear path toward regenerative, place-based solutions in the built environment [71; 81].

Contribution to a circular economy. The linear and open-ended characteristics of current economic systems (functioning in a resource depletion paradigm) rely on large quantities of cheap, easily accessible materials and energy. The linear economy is a model reaching its physical limits. The circular economy encompasses a positive development cycle that preserves and enhances natural capital while circulating the resources in a closed-loop to produce very little waste or no waste [29]. Unused spaces can be creatively changed, reinvented with little resource input through a circular solution [35]. The circular economy is restorative and regenerative by design [58]. McDonough and Braungart [54] discuss the design for disassembly as a strategy for transitioning from a cradle-to-grave to a cradle-to-cradle flow in the built environment.

The central role of education. Education is central to the concept of a regenerative future. Breaking of usual educational patterns and empowering children at young ages is critical for future regenerative practitioners. Design inevitably instructs us about our relationships with nature and people that make us more or less mindful and more or less ecologically competent [63].

Public engagement. The practice of designing urban areas needs to deliver optimal environments that effectively adapt and respond to people's behavior. Meanwhile, not all social groups are accessing and benefiting from urban green infrastructure [60]. Within this context, urban public green space design must embrace citizens' ideals that can be achieved if effective methods of communication, involvement, and feedback are ensured [17]. Urban planning projects must specifically address citizens' wishes and needs and their agenda rather than merely the agenda of professionals [13].

Economic benefits. The sustainability concept includes a blend of ecological, economic, and social aspects [64]. Necessarily, the ecological handprint concept (initiatives that bring a social dimension to measuring the footprint) is gaining notoriety [33]. There are many cases where smart integration of nature resulted in an area's higher property value [47, 87]. Green facades and green roofs can significantly reduce air conditioning needs and save energy used for heating [39]. Many examples of such buildings already exist (such as the Bosco Verticale buildings in Milan, Italy) and inspire architectural works. Greener cities also have an impact on citizen health, which can decrease health care costs. Maller et al. [50] argue that a healthy environment promotes a strong economy and that human restoration is part of ecological restoration.

The above can be summarized in a series of obstacles, limitations, challenges, and opportunities for restorative sustainability thinking and practice, as presented in Table 1.

Landscape architects and architects are the designers of the places we live, move, work, and have recreational activities. To those professionals falls the responsibility to design the landscapes of tomorrow and find ways to reintroduce nature into the built environments adopting the biophilic design approach as a useful implementation tool for achieving the United Nations Sustainable Development Goals (SDGs) [65]. The SDGs adopted by all United Nations Member States in 2015 address the most significant challenges humanity faces and intends to ensure that future generations of all countries have the same opportunities to live a better life without compromising the planet. However, universities' role is to trigger sustainability values, attitudes, and behavior and contribute to sustainability transitions at the individual scale and the global dimension of the current environmental crisis [79] to collaborate with practitioners and policymakers.

Conclusions

Mass urbanization presents one of the most urgent challenges of the 21st century. The need for urban growth due to the growing population has to include environmentally sustainable policies to address the problem under a healthy environment. A paradigm shift is needed towards sustainability in urban areas, leading to solutions that enhance users' experience, comfort, health, well-being, satisfaction, and harmony with urban and natural ecosystems, reconnecting users to nature.

Biophilia and nature-based solutions can help improve design quality and bring new opportunities to restore urban ecosystems and sustainability/smart thinking in the built environment. Urban planners and designers should consider that man is a part of ecosystems and not a separate entity. There are many exciting and potentially ground-breaking research areas on the restorative built environment and biophilic design. Current social, environmental, and economic impacts of nature in cities are underdeveloped and better tools are needed. A greater understanding of the mechanisms and potential for design based on the Biophilia hypothesis may transform it into an opportunity to expedite urban ecosystems' healing.

Demonstration of living solutions inspired and supported by nature will provide evidence on the environmental, social, and economic benefits of biophilic design—solutions that bring more natural features and processes into cities through locally adapted and resource-efficient interventions. Further research is needed to evaluate the long-term benefits of biophilic design and re-naturing cities.

Acknowledgments

The present paper has been funded through the Foundation for Science and Technology through project PTDC/GES-URB/31928/2017 "Improving life in a changing urban environment through Biophilic Design." We also express our gratitude for the insight gained during the RESTORE Training School organized in Lancaster, UK.

References

1. **Akin, U.** Urban agriculture: an instrument for sustainable urban development in the metropolitan city of Istanbul. *Journal of Environmental Protection and Ecology*, 2011, No. 12(4A), p. 2245–2254.
2. **Alvarsson, J. J., Wiens, S., Nilsson, M. E.** Stress recovery during exposure to nature sound and environmental noise. *International Journal of Environmental Research and Public Health*, 2010, No. 7(3), p. 1036-1046.
3. **Anderson, R.** Compliance is not a vision. **In** *FutuREstorative: Working Towards a New Sustainability*, London: RIBA Publishing, 2016, p. 116–120.
4. **Barton, J.; Pretty J.** What is the best dose of nature and green exercise for improving mental health? A multi-study analysis. *Environmental Science and Technology*, 2010, No. 44(10), p. 3947–3955.
5. **Bayon, M. C., Saravi, G. A.** The cultural dimensions of urban fragmentation: Segregation, Sociability, and Inequality in Mexico City. *Latin American Perspectives.* 2013, No. 40(2), p. 35-52.
6. **Beatley, T.** *Handbook of biophilic city planning and design*, Washington: Island Press, 2017. 312p.
7. **Beatley, T. Newman, P.** Biophilic cities are sustainable, resilient cities. *Sustainability*, 2013, No. 5(8), p. 3328–3345.
8. **Berto, R**. Exposure to restorative environments helps restore attentional capacity. *Journal of Environmental Psychology*, 2005, No. 25, p. 249–259.
9. **Berto, R.** The role of nature in coping with psychophysiological stress: a literature review on restorativeness. *Behavioral Sciences,* 2014, No. 4, p. 394–409.
10. **Bezold, C. P., Banay, R. F., Coull, B. A., Hart, J. E., James, P., Kubzansky, L.D., Missmer, S. A., Laden, F.** The relationship between surrounding greenness in childhood and adolescence and depressive symptoms in adolescence and early adulthood. *Annals of Epidemiology*, 2018, No. 28(4), p. 213–219.
11. **Birkeland, J.** *Positive Development: From Vicious Circles to Virtuous Cycles through Built Environment Design*. London: Routledge, 2008, 432p.
12. **Blau, M. L., Luz, F., Panagopoulos, T.** Urban river recovery inspired by nature-based solutions and biophilic design in Albufeira, Portugal. *Land*, 2018, No. 7, p. 141; https://doi.org/10.3390/land7040141
13. **Brabham, D. C.** Crowdsourcing the public participation process for planning projects. *Planning Theory*, 2009, No. 8, p. 242-262.
14. **Brown, M.** *FutuREstorative: Working Towards a New Sustainability*, London: RIBA Publishing, 2016, 176p.

15. **Brown, M., Haselsteiner, E., Apro, D.** et al. *Sustainability, Restorative to Regenerative*. Vienna: Ingeburg Hausmann, 2018, 120 p.
16. **Browning, W., Kallianpurkar, N., Ryan, C.** et al. The Economics of Biophilia. New York: Terrapin Bright Green, 2015, 40p.
17. **Bugs, G., Granell, C., Fonts, O., Huerta, J., Painho, M.** An assessment of public participation GIS and Web 2.0 technologies in urban planning practice in Canela, Brazil, *Cities*, 2010, No. 27, p. 172-181.
18. **Burley J. B.** The emergence of landscape urbanism: A chronological criticism essay. *Land*. 2018; 7(4):147.
19. **Ceschin, F., Gaziulusoy, I.** Evolution of design for sustainability: From product design to design for system innovations and transitions. Design Studies, 2016, No, 47, p. 118-163.
20. **Cole, R. J.** Transitioning from green to regenerative design. *Building Research & Information*, 2012, No. 40(1), p. 39–53.
21. **Cramer, J. S., Browning, W. D.** Transforming building practices through biophilic design. **In** Biophilic Design: The Theory, Science and Practice of Bringing Buildings to Life. Hoboken: John Wiley & Sons, 2008, p. 335–346.
22. **Dahl, R.** Greenwashing: Do you know what you're buying? *Environmetnal Health Perspectives*, 2010, No. 118(6), p. 246–252.
23. **Daigneault, A., Brown, P., Gawith, D.** Dredging versus hedging: Comparing hard infrastructure to ecosystem-based adaptation to flooding. *Ecological Economics*, 2016, No. 122, p. 25-35.
24. **De Vries, S., Verheij, R. A., Groenewegen, P. P., Spreeuwenberg, P.** Natural environments - healthy environments? An exploratory analysis of the relationship between greenspace and health. *Environment and Planning A,* 2003, No. 35, p. 1717-1731.
25. **DuPlessis, C., Brandon, P.** An ecological worldview as basis for a regenerative sustainability paradigm for the built environment. *Journal of Cleaner Production*, 2015, No. 109, p. 53–61.
26. **Ferreira, V., Barreira, A. P. C., Loures, L., Antunes, M. D., Panagopoulos, T.** Stakeholders engagement on nature-based solutions: A systematic literature review. *Sustainability*, 2020, No. 12, 640; https://doi.org/10.3390/su12020640
27. **Finocchiaro, L.** 2019. Enhancing Environmental Performance of Vernacular Architecture. A Case Study. **In** *Sustainable Vernacular Architecture. Innovative Renewable Energy*. Cham, Switzerland: Springer, pp. 257-273.
28. **Fromm, E.** The heart of man: its genius good and evil, New York: Perennial Library, 1964, 144p.
29. **Geissdoerfer, M., Savaget, P., Bocken N. M. P., Hultink, E. J.** The circular economy – A new sustainability paradigm? *Journal of Cleaner Production*, 2017, No. 143, p. 757-768.
30. **Grinde, B., Patil, G. G.** Biophilia: does visual contact with nature impact on health and well-being? *International Journal of Environmental Research and Public Health*, 200, No. 96(9), p. 2332-2343.
31. **Guenther, R.** Transforming hospitals: building restorative healthcare. *Architectural Design*, 2017, No. 87(2), p. 128–133.
32. **Guimaraes, M. E., Catela, N. L., Barreira, A. P., Panagopoulos T.** What makes people stay in or leave shrinking cities? An empirical study from Portugal. *European Planning Studies*, 2016, No. 24(9), p. 1684-1708.
33. **Hayward, B.** The social handprint. **In** Relational Architectural Ecologies: Architecture, Nature and Subjectivity. London: Routledge, 2013, p. 233-248.
34. **Hava, H., Zhou, H. L., Mehlenbeck, C., King, A., Lombardi, E. M., Baker, K., Kaufman, A., Correll, N. SIRONA**: Sustainable Integration of Regenerative Outer-space Nature and Agriculture. Part 2 – design development and projected performance. Acta Astronautica, 2020, https://doi.org/10.1016/j.actaastro.2020.07.001
35. **Herman, K., Sbarcea, M. Panagopoulos, T.** Creating green space sustainability through low-budget and upcycling strategies. *Sustainability,* 2018, No. 10, p. 1857; http://dx.doi.org/10.3390/su10061857
36. **Hernández, B., Hidalgo, M. C.** Effect of urban vegetation on psychological restorativeness. *Psychological Reports*, 2005, No. 96, p. 1025–1028.
37. **Herzog, T. R., Chen, H. C., Primeau, J. S.** Perception of the restorative potential of natural and other settings. *Journal of Environmental Psychology*, 2002, No. 22, p. 295–306.
38. **Hidalgo, A. K.** 2014. Biophilic design, restorative environments and well-being. Proceedings of the 9th International Conference on Design & Emotion. Ediciones Uniandes: Bogota, p. 535–544.
39. **Jaffal, I., Ouldboukhitine, S. E., Belarbi, R.** A comprehensive study of the impact of green roofs on building energy performance. *Renewable Energy*, 2012, No. 43, p. 157-164.
40. **Joye, Y., De Block, A.** 'Nature and I are Two': A Critical Examination of the Biophilia Hypothesis. *Environmental Values,* 2011, No. 20, p. 189-215.
41. **Kambo, A., Drogemuller, R., Yarlagadda, P. K. D. V.** Assessing biophilic design elements for ecosystem service attributes – A sub-tropical Australian case. *Ecosystem Services*, 2019, No. 39, p. 100977.
42. **Kaplan, S.** The restorative benefits of nature: Toward an integrative framework. *Journal of Environmental Psychology*, 1995, No. 15, p. 169-182.
43. **Kellert, S., Calabrese, E.** The Practice of Biophilic Design. www.biophilic-design.com, accessed 29 March 2015.
44. **Kellert, S. R.** Building for life. Designing and understanding the human-nature connection. *Renewable Resources Journal*, 2006, No.24, p 8-24.
45. **Kellert, S. R., Heerwagen, J., Mador, M.** *Biophilic Design. The Theory, Science and Practice of Bringing Buildings to Life*. Hoboken: John Wiley & Sons Inc, 2008, 432p.
46. **Lee, A. C. K., Maheswaran, R.** The health benefits of urban green spaces: a review of the evidence. *Journal of Public Health*, 2011, No. 33(2), p. 212–222.
47. **Lee, J. S., Li, M. H.** The impact of detention basin design on residential property value: case studies using GIS in the hedonic pricing model. *Landscape and Urban Planning*, 2009, No. 89, p. 7–16.
48. **Ling, T. Y., Chiang, Y. C.** Well-being, health and urban coherence-advancing vertical greening approach toward resilience: A design practice consideration. *Journal of Cleaner Production*, 2018, No. 182, p. 187-197.

49. **Louv, R.** *Last Child in the Woods: Saving Our Children From Nature-Deficit Disorder*. Chapel Hill: Algonquin Books, 2005, 416p.
50. **Maller, C., Townsend, M., Pryor, A., Brown, P., Leger, L**. Healthy nature healthy people: "contact with nature" as an upstream health promotion intervention for populations. *Health Promotion International*, 2006, No. 21, p. 45–54.
51. **Mang, P., Reed, B.** Regenerative development and design. **In** *Sustainable Built Environments*. New York: Springer, 2013, pp. 478–501.
52. **Mang, P., Reed, B.** The nature of positive. *Building Research & Information,* 2015, No. 43, p. 7-10.
53. **Mazuch, R.** Salutogenic and biophilic design as therapeutic approaches to sustainable architecture. *Architectural Design*, 2017, No. 87(2), p. 42–47.
54. **McDonough,W., Braungart, M.** *Cradle to Cradle: Remaking the Way We Make Things*. New York: North Point Press, 2002, 193p.
55. **McGee, B., Marshall-Baker, A.** Loving nature from the inside out. A Biophilia matrix identification strategy for designers. *Health Environments Research & Design Journal*, 2015, No. 8(4), p. 115–130.
56. **Moore, R. C.** The need for nature: a childhood right. *Social Justice*, 1997, No. 24(3), p. 203–220.
57. **Moore M, Gould P, Keary B. S.** Global urbanization and impact on health. Int J Hyg Environ Health. 2003, No. 206, p. 269-278.
58. **Morseletto, P.** Restorative and regenerative: Exploring the concepts in the circular economy. *Journal of Industrial Ecology,* 2020, No. 24, p. 763-773. https://doi.org/10.1111/jiec.12987
59. **Naboni, E., Natanian, J., Brizzi, G., Florio, P., Chokhachian, A., Galanos, T., Rastogi, P.** A digital workflow to quantify regenerative urban design in the context of a changing climate. *Renewable and Sustainable Energy Reviews*, 2019, No. 113, p. 109255.
60. **O'Brien, L., De Vreese, R., Olafsson, A.S. et al.** Social and environmental justice: Diversity in access to and benefits from urban green infrastructure – examples from Europe. **In** *The Urban Forest,* Cham, Switzerland: Springer, 2017, p. 153-190.
61. **Oreskes, N.** The scientific consensus on global warming. *Science*, 2004, 306(5702), p. 1686.
62. **Orr, D.** Architecture, ecological design and human ecology. **In** *The Green Braid: Towards an Architecture of Ecology, Economy and Equity*. London: Routledge, 2007, p. 15–33.
63. **Orr, D.** W. *Earth in Mind: Education, Environment, and the Human Prospect.* Washington: Island Press, 2004, 240p.
64. **Panagopoulos, T.** Linking forestry, sustainability and aesthetics. *Ecological Economics*, 2009, No. 68, p. 2485-2489.
65. **Panagopoulos, T.** Landscape urbanism and green infrastructure. *Land*, 2019, No. 8(7), p. 112, https://doi.org/10.3390/land8070112
66. **Panagopoulos, T., Gonzalez Duque, J. A., Dan. B. M.** Urban planning with respect to environmental quality and human well-being. *Environmental Pollution*, 2016, No. 208, p. 137–144.
67. **Panagopoulos, T., Jankovska, I., Bostenaru, D. M.** Urban green infrastructure: the role of urban agriculture in city resilience. *Urbanism Architecture Constructions*, 2018, No. 9, p. 55–70.
68. **Parsaee, M., Demers, C. M. H., Hébert, M., Lalonde, J. F., Potvin, A.** A photobiological approach to biophilic design in extreme climates. *Building and Environment*, 2019, No. 154, p. 211-226.
69. **Peters, T.** Superarchitecture: Building for better health. *Architectural Design*, 2017, No. 87(2), p. 24–31.
70. **Petrişor, A. I.** Multi-trans and inter-disciplinarity, essential conditions for the sustainable development of human habitat. *Urbanism Architecture Constructions*, 2013, No. 4(2), p. 43–50.
71. **Plaut, J. M., Dunbar, B., Wackerman, A., Hodgin, S.** Regenerative design: The LENSES Framework for buildings and communities. *Building Research & Information*, 2012, No. 40(1), p. 112-122.
72. **Prasad, S.** Regenerative agents: patient-focused architectures. *Architectural Design*, 2017, No. 87(2), p. 122–127.
73. **Ramzy, N. S.** Biophilic qualities of historical architecture: In quest of the timeless terminologies of "life" in architectural expression. *Sustainable Cities and Societies*, 2015, No. 15, p. 42–56.
74. **Rascu, A., Moise, L., Naghi, E., Deleanu, O. C., Arghir, O. C.** Sick building syndrome – a reality and a challenge for physicians. *Journal of Environmental Protection and Ecology*, 2015, No. 16(3), p. 1132–1141.
75. **Redlich, C. A., Sparer, J., Cullen, M. R.** Sick-building syndrome. *The Lancet*, 1997, No. 349, p. 1013–1016.
76. **Ryan, C. O., Browning, W. D., Clancy, J. O., Andrews, S. L., Kallianpurkar, N. B.** Biophilic design patterns: Emerging nature-based parameters for health and well-being in the built environment. *International Journal of Architectural Research*, 2014, No. 8(2), p. 62–76.
77. **Satterthwaite, D.** How urban societies can adapt to resource shortage and climate change. *Philosophical Transactions: Mathematical, Physical and Engineering Sciences*, 2011, No. 369(1942), p. 1762-1783.
78. **Snell, T. L., Lam, J. C. S., Lau W. W. Y., Lee, I., Maloney, E. M., Mulholland, N., Wilson, L., Wynne, L. J.** Contact with nature in childhood and adult depression. *Children, Youth and Environments*, 2016, No. 26(1), p. 111-124.
79. **Sonetti, G., Brown, M., Naboni, E.** About the triggering of UN Sustainable Development Goals and regenerative sustainability in higher education. *Sustainability,* 2019, No. 11, p. 254.
80. **Soule, M. E.** Biophilia unanswered questions. **In** *The Biophilia Hypothesis*, Washington DC: Island Press, 1993, p. 441-455.
81. **Svec, P., Berkebile, R., Todd, J. A.** REGEN: Toward a tool for regenerative thinking. *Building Research & Information,* 2012, No. 40, p. 81-94.
82. **Taylor, A., Kuo F. E., Sullivan, W. C.** Coping with ADD: the surprising connection to green play settings. *Environment and Behavior*, 2001, No. 33(1), p. 54-77.
83. **Thomson, G., Newman, P.** Urban fabrics and urban metabolism – from sustainable to regenerative cities. *Resources, Conservation and Recycling*, 2018, No. 132, p. 218-229, https://doi.org/10.1016/j.resconrec.2017.01.010.
84. **Tidball, K. G.** Urgent biophilia: Human-nature interactions and biological attractions in disaster resilience. *Ecology and Society*, 2012, No. 17(2), art. 5.

85. **Tzoulas, K., Korpela, K., Venn, S., Yli-Pelkonen, V., Kaźmierczak, A., Niemela, J., James, P.** Promoting ecosystem and human health in urban areas using green infrastructure: A literature review. *Landscape and Urban Planning*, 2007, No. 81(3), p. 167–178.
86. **Ulrich, R.** View through a window may influence recovery from surgery. *Science*, 1984, No. 224, p. 420–421.
87. **Voicu, I., Been, V.** The effect of community gardens on neighboring property values. *Real Estate Economics*, 2008, No. 36, p. 241-283.
88. **White, M. P., Alcock, I., Wheeler, B. W., Depledge, M. H..** Would you be happier living in a greener urban area? A fixed-effects analysis of panel data. *Psychological Science*, 2013, No. 24(6), p. 920–928.
89. **Wilson, E. O.** *Biophilia*, Harvard: Harvard University Press, 1984, 157p.
90. **Wilson, E. O.** Biophilia and the Conservation Ethic. **In** *The Biophilia Hypothesis*. Island Press: Washington DC, 1993, p. 31-41.
91. **Wolch, J. R., Byrne, J., Newell, J. P.** Urban green space, public health, and environmental justice: The challenge of making cities "just green enough". *Landscape and Urban Planning*, 2014, No. 125, p. 234–244.
92. **Woo, L. C.** Ecomimesis: A model for sustainable design. *Journal of Sustainability, Energy & the Environment*, 2016, No. 3, p. 82-102.
93. **World Commission on Environment and Development.** *Our Common Future.* Oxford: Oxford University Press. 1987.
94. **Zhang, X., Skitmore, M., DeJong, M., Huisingh, D., Gray, M.** Regenerative sustainability for the built environment - From vision to reality: an introductory chapter. *Journal of Cleaner Production*, 2015, No. 109, p. 1-10.

AUTHORS:
Thomas Panagopoulos has a Ph.D. in Forestry and Natural Environment and is Professor of Landscape Architecture at the University of Algarve, where he is a member of the coordinating body of the Ph.D. Program in Innovation and Land Management. Member of the Research Centre for Tourism, Sustainability and Well-being, Campus de Gambelas, 8005-139 Faro, Portugal. E−mail: tpanago@ualg.pt
Madalina Sbarcea is a Ph.D. candidate at the Ion Mincu University of Architecture and Urbanism, Bucharest, Romania. Member of the project RESTORE (Rethinking Sustainability Towards a Regenerative Economy) financed by European Union Horizon 2020. She is currently a researcher at the Danube Delta National Institute for Research and Development, 820112 Tulcea, Romania. E−mail: madalina.sbarcea@ddni.ro
Krzysztof Herman is a Doctor of Landscape Architecture, a specialist in placemaking, low-budget strategies in urban design, social participation in the design process. He is an Assistant Professor at the Department of Landscape Art, Warsaw University of Life Sciences, Poland and a Visiting Scholar at School of Architecture, Victoria University of Wellington, New Zealand. E-mail: krzysztof_herman@sggw.edu.pl

Kopsavilkums. Biofilais dizains veicina īpašus uz dabu vērstus, veselīgas labklājības risinājumu principus, noteiktus modeļus telpās, kurās mēs dzīvojam un strādājam. Pieaugošais izpētes apjoms pakāpeniski iezīmē nozīmīgu lomu pilsētvides projektēšanā un arhitektūrā, uzsverot nepieciešamību saglabāt, uzlabot un atjaunot labvēlīgus dabas apstākļus pilsētvidē. Biofilija un uz dabu balstīti risinājumi var uzlabot veidotās vides dizaina kvalitāti un radīt jaunas iespējas atjaunot pilsētu ekosistēmas un gudru domāšanu ilgtspējīgām pilsētām. Pētījumā secināts, ka biofilu principu ieviešana pilsētplānošanā novedīs pie pilsētām, kas var atjaunot dzīvi un uzlabot veselību, labklājību.

DOI: 10.22616/j.landarchart.2020.17.09

Smart and Sustainable Local Communities in Global Covid-19 Pandemic Conditions

Pudzis Edgars, Krutova Una, Geipele Sanda, Kalinka Maris, Auzins Armands
Riga Technical University, Latvia

Abstract: The COVID-19 pandemic has brought many changes in everyone's life. Villages and rural areas are among the places where people have sought refuge in order to stay away from others and to be able to comply with government regulations during an emergency. Crisis conditions require the choice of means of communication, remote employment and self-help and self-support. Smart and strong communities or villages – this means more than only technologically and economically advanced communities – can be more successful in overcoming the crisis. This study analyses the characteristics of smart communities, the external factors influencing the functioning of these communities, as well as the specific circumstances caused by the first wave period of the Covid-19 pandemic (from March 2020 till June 2020). Collecting basic information on smart communities, external factors and special circumstances, and using the methods of analysis, comparison and drawing conclusions, the most important factors that have positively affected communities in the pandemic conditions have been taken into account within the framework of this study, clearly indicating the sustainability and development advantages of smart communities in Latvia. Nobody knows what will be "new normal" after COVID-19, but some benefits of smart thinking are noticed.

Keywords: COVID-19, smart villages, spatial planning; village development; community development; signs of the smart village; neighbourhood planning

Introduction

General Information about the Research

The aim of this study is to investigate the options for the local community in the first period of COVID-19 restrictions set by the government of Latvia and whether it is possible to use the advantages of smart villages and strong communities in this period. The local community described in this study emphasises villages in the territory of Latvia, which are located on the coast of the Gulf of Riga.

Accordingly, **the following objectives** have been set: (1) to describe the theoretical aspects of the concept of smart villages; (2) to show how COVID-19 restrictions affect the behaviour of communities (3) to find out a positive role of smart and strong communities in unpredictable obstacles when "face-to-face" communication is restricted; (4) to find answers to the open question: "Can social life be provided remotely for a long time and where the reality remains – social and cultural activities?"; and (5) to open up a discussion on the potential future and "new normal".

For this study, the main **research questions** are: "Could it be possible to find something evolving for communities in the COVID-19 situation? Is a smart community better suited to difficult, unpredictable conditions?"

The present research has been conducted using various datasets available from statistical sources, as well as summarising theoretical information about the concept of SMART village, regulatory framework and identifying SMART village features by means of logical data analysis and comparative methods.

The study of several restrictions in Latvia regarding COVID-19 covers the period of 12 March 2020 till 10 June 2020 – the first period of an emergency situation [14].

In Latvia, several restrictions were set for three months: teleworking, if possible; distance learning in schools; distance keeping, gathering restrictions for up to five people. At the same time, different services such as public transport, education services, culture services, etc. were reduced or cancelled [14]. In addition, the population began to make extensive use of digital technologies and the opportunities they provide for mutual communication, school and university learning processes, the purchase of necessary goods and business management. Many of these processes are also included in the Smart Village concept and are applicable to the management of economic processes and the provision of primary needs. Moreover, strong communities more used interaction activities to improve self-care and mutual assistance services.

The research territorial areas cover small villages in Latvia. As example territories two coastal villages in Latvia – Tuja and Garupe are chosen, because this research is a part of research paper series that are created under INTERREG Central Baltic programme project "Coast4us".

The study shows the strengths of smart community potential, which have positively affected a community/village ability to respond to the challenges posed by COVID-19 pandemic in Latvia.

The research uses: (1) literature review method for an overview of theoretical aspects of the smart village concept and local community identification; (2) the analysis of secondary and primary data; and (3) discourse analysis and synthesis as well as graphical methods for designing the main research results. The results are summarised in Table 1 at the end of the study.

The Idea of Smart Village Concept

Smart Villages are communities in rural areas that use innovative solutions to improve their resilience, building on local strengths and opportunities. They rely on a participatory approach to develop and implement their strategy to improve their economic, social and/or environmental conditions, in particular by mobilising solutions offered by digital technologies. Smart Villages benefit from cooperation and alliances with other communities and actors in rural and urban areas. The initiation and implementation of Smart Village strategies may build on existing initiatives and can be funded by a variety of public and private sources. Communities in rural areas can include one or several human settlements, without any restrictions regarding the administrative boundaries or the number of inhabitants. As regards eligibility conditions for support, EU Member States may use definitions of rural areas as provided for by the OECD, EUROSTAT or other definitions. A participatory approach means active participation of the local community in the drawing up and decision-making regarding the Smart Village strategy. During the implementation phase, the participatory approach will ensure that the needs for capacity building and the training of people are properly addressed. Digital technologies include, for example, information and communication technologies, the exploitation of big data or innovations related to the use of the Internet of Things (IoT). They act as a lever to enable Smart Villages to become more agile, make better use of their resources and improve the attractiveness of rural areas and the quality of life of rural residents. The use of digital technologies is not a precondition for becoming a Smart Village. Where possible, high-speed broadband will facilitate the deployment of digital solutions. Smart Village strategies respond to the challenges and needs of their territory by building on their local strengths and assets. Strategies must determine short-, medium- and long-term goals. Progress must be measurable through performance indicators that will be set in a roadmap. These roadmaps should be reviewed at regular intervals to allow for continuous improvement. Strategies may aim, for example: to improve access to services (in various fields such as health, training or transport), to enhance business opportunities and

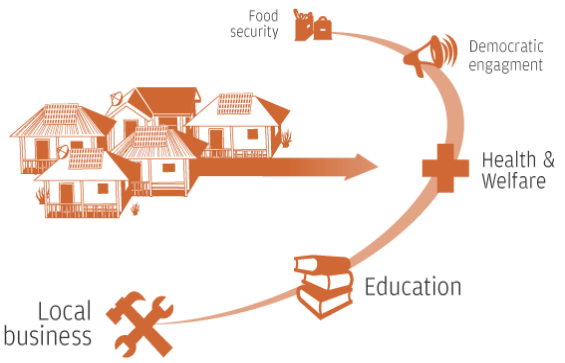


Fig. 1. The concept of Smart Village [11]

create jobs, to the development of short food supply chains and farming practices, to the development of renewable energies, to the development of a circular economy, to better exploitation of natural resources, to adapt to climate change, to preserve the environment and biodiversity, to a better valorisation of the cultural heritage for a greater tourist attractiveness etc. [16].

On 22 May 2018, EU Commissioner Phil Hogan said, *"Smart villages are all about making different policies work together to find better, smarter ways to promote holistic rural development. It is about harnessing existing and emerging technologies and social innovations to add value to the lives of our citizens. It is about giving villages the tools to address their own challenges while also making a contribution to the bigger challenges facing society as a whole"* [15].

Smart village is an advanced concept of off-grid community where every component of the basic human rights relates to smart technology. Renewable and sustainable energy service performs as a facilitator for development in the smart village concept. Figure 1 shows the smart services available in a smart village [8].

Smart villages are rural areas and communities that use their existing strengths and values, as well as develop new opportunities to create new added value. In smart villages, traditional things and new approaches are sought and improved through digital communication technologies, innovation and better application of knowledge for the benefit of citizens [7].

Smart villages are based on people, i.e., rural communities that take the initiative to find practical solutions both to solve existing problems and to make the most of new opportunities for the transformation of rural areas in the future [4].

The term "smart" implies:

- The use of digital technology where it is applicable, not because it is modern or up-to-date. Smart villages often use the added value of digital technologies, but this is only one of the tools to improve performance;

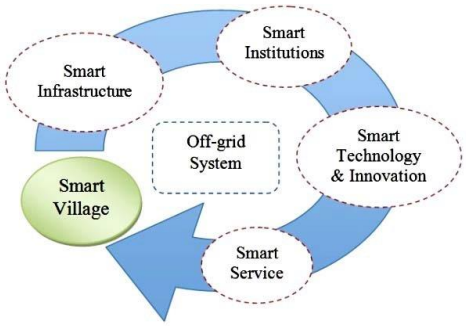


Fig. 2. The concept of Smart Village [8]

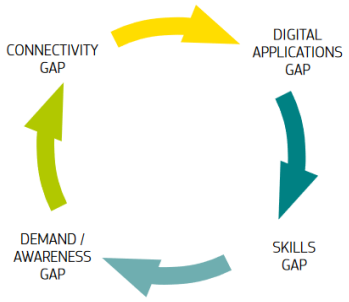


Fig. 3. Links between connectivity, digital applications, skills and demand gaps [15]

- Thinking outside the village. Some of the current Smart Village practices stop working in the village area, but there are also some that include the surrounding rural area, village groups, small towns and cooperation with large cities;
- New cooperation and the development of new forms of cooperation – between farmers and other entrepreneurs in rural areas, between municipalities, the private and public sectors, cooperation takes place from the bottom up and from the top down;
- Care for oneself. There is no single common model or solution to the Smart Village approach – the main emphasis is on local people and their ability to use local resources, apply their knowledge and take the initiative.

It is clear from these smart village cases that a community cannot rely on internal resources in a crisis without going beyond villages or community borders. There is a need for a link that ensures cooperation with neighbouring communities and municipal and state institutions (see Figure 2).

To make rural communities benefit from digital strategies and create the conditions for Smart Villages, it is necessary to use all three components of the digital divide while taking into account the specific needs of each rural area and the existing landscape of policy support such as:

- Broadband infrastructure;
- Promoting the uptake of digital services;
- Digital skills and literacy.

They need to be addressed together in digitisation strategies [15]. Figure 1 shows links between connectivity, digital applications, skills and demand gaps.

According to Figure 3, the three aforementioned components reinforce each other, so if not addressed together, it would lead to a low level of awareness, demand and uptake of digital technologies, which in turn damage the business case for further investments.

Overview of Precautions for Distribution of COVID-19

The World Health Organisation gives simple precautions with regard to the distribution of COVID-19, that are mainly connected with washing hands, distancing, good respiratory hygiene, etc. [3].

These established guidelines require people to be careful and limit their activities to a minimum when meeting others. In view of the above, individuals lose direct contact within the framework of business and social communication. As a result, communities lose their traditional approach of direct social and economic communication between neighbours or neighbouring communities.

Latvia separately by Cabinet of Ministers Order No. 103 of 12 March 2020 imposed certain restrictions on education, assembly, international passenger transport, health care and other. There are the main points for restrictions [14]:

- State and local government institutions shall evaluate and, as far as possible, ensure the provision of face-to-face services remotely;
- To terminate the study process in person in all educational institutions, all types of the educational process in full form outside educational institutions and to provide studies remotely;
- To allow the gathering of both indoor and outdoor people at such organised events for up to 25 people, ensuring epidemiological and social distance;
- To determine that the place of performance of cultural, religious activities, entertainment, sports and other recreational places shall start not earlier than at 6.30 and end not later than 24.00;
- For persons designated by the Centre for Disease Prevention and Control as COVID-19 infectious disease contact persons – Self-isolation at the place of residence (home quarantine) and availability must be provided for 14 days in order to be able to communicate and cooperate with the family doctor and other medical personnel;
- From 17 March 2020, to stop the international carriage of passengers by air, sea, road and rail, with the exception of passenger transport by state aircraft and military transport, as well as private and business flights (with a maximum of five passengers); to resume international air, sea, bus and rail passenger transport to or from Lithuania and Estonia as of 15 May 2020.

Fig. 4. Community interaction scale [13]

These restrictions practically stopped face-to-face meetings outside one household and necessitated adaptation to work and social activity.

The Idea of Local Village Community

The status of a village shall be granted and revoked by a municipality council, based on the local government territorial planning, in which the village border is defined and the need for developing a village is justified. The status of a village may be granted to such section of a municipality territory in which concentrated building is present (or is planned), people are living permanently, and the appropriate infrastructure has been developed [13].

Taking into account that historically in Latvia, the villages have not formed as built-up areas but, among other things, are based on interpersonal ties and needs, as well as, in theory, such a territorial limitation forms a community, further in the present study the authors will examine the integrated development of villages and communities or territorial communities that have a clearly defined operational limitation [13].

When discussing the existence of a community and its strength during an emergency, it is necessary to focus on the basic needs of the community and the performance of daily affairs: social communication, business activities, the performance of basic functions, necessary needs, etc.

Towards an even deeper understanding of community development, Thomas (1991) [18] has created the community interaction scale, which is divided into two blocks and grouped into grades from 1 to 11 (see Figure 4). The scale consists of grades that are separated because they distinguish between lower, regular and obvious community interaction aspects (from 1 to 6) and higher/more complex and formal organisational aspects of community life (from 7 to 11) [13].

The present study prioritises digital technology and smart village opportunities for social and economic interaction within the community. The benefits of strong communities are analysed in the discussion section and the results are shown in Table 1.

Literature Review and Analytical Assessment

According to the Smart Communities Guidebook (1997) [9], a “smart community” is a community in which members of local government, business, education, health care institutions and the general public understand the potential of information technology, and form successful alliances to work together to use technology to transform their community in significant and positive ways.

Smart Village and Business

Smart Village is a relatively new concept within the realm of EU policy making. The emerging concept of Smart Village refers to rural areas and communities that use their existing strengths and assets as well as develop new opportunities. In Smart Village, traditional and new networks and services are enhanced by means of digital, telecommunication technologies, innovations and better use of knowledge for the benefit of inhabitants and businesses. Digital technologies and innovations may support the quality of life, higher standard of living, public services for citizens, better use of resources, less impact on the environment, and new opportunities for rural value chains in terms of products and improved processes. The concept of Smart Village does not propose a one-size-fits-all solution. It is territorially sensitive, based on the needs and potentials of the respective territory, as well as strategy-led, i.e., supported by new or existing territorial strategies. Technology is important along with investments in infrastructure,

MULTI-SERVICE HUBS	MOBILE SERVICES
Colocation into multi-service hubs provides one means by which rural service businesses can survive or even thrive. These can be planned, as is happening in rural Finland and Belgium. Equally, hubs can develop in a more organic way, as when a garage takes on the post office and then develops a food retail function.	These can provide essential services to local communities while at the same time ensure the viability of small firms by increasing their customer base. Examples include mobile dentists, vets, building maintenance and shops of various kinds.
DIGITAL DIVERSIFICATION	**SHORT SUPPLY CHAINS**
Architects, lawyers, consultants, and other professionals can all provide a wide range of services using digital solutions..	These have long been an adaptive strategy for small food firms to gain a competitive edge.

Fig. 5. The main strategies for business in small territories [2]

business development, human capital, capacity and community building. Good governance and citizen involvement are also key factors. Smart Village would typically pay attention to e-literacy skills, access to e-health and other basic services, innovative solutions for environmental concerns, circular economy application to agricultural waste, promotion of local products supported by technology and ICT, implementing and taking full benefit of smart specialisation agri-food projects, tourism and cultural activities, etc. The concept of Smart Village covers human settlements in rural areas, as well as the surrounding landscapes [7].

Common Agricultural Policy (CAP) includes six priorities where the last priority (No. 6) discusses social inclusion and economic development. This priority is divided into three groups: facilitating diversification, creation and development of small enterprises, as well as job creation, fostering local development in rural areas and enhancing the accessibility, use and quality of information and communication technologies (ICT) in rural areas [12].

Private sector businesses need to generate profit to survive. The key question is whether the level of demand is sufficient to justify a business proposition: will the income be sufficient to cover costs and generate enough profit to pay back loans and reward other sources of finance? For large companies operating on a national or global scale the answer often is “no”, they can do better elsewhere. For smaller, more territorially rooted enterprises, there appear to be four main strategies (see Figure 5) [2].

COVID-19-related restrictions, which called for staying at home, “drove” part of the population to the countryside. In Latvia, in addition to the apartment in the city, citizens often also own a country property or holiday house.

In order to be able to do the work, to follow the lectures and classes, almost everyone was forced to raise their IT gaps, especially in remote communication.

Within a few days after an emergency situation had been announced, theoretical strategies were implemented in life (see Figure 3):

- Digital diversification – it turned out that public employees, teachers, lecturers, architects, etc., can really work from home;
- Farmers and local restaurants learned to build websites and began delivering products to neighbours at home, strengthening and putting into practice short supply chains;
- Larger supply businesses expanded the supply areas from Riga suburb to the whole territory of Latvia; reduced delivery price; started services for small, one-family orders and supplemented the range of goods with basic necessities, such as disinfectants, creating a special combination of multi-service hub and mobile service (mobile multi-service).

Villages/Communities and IT Technologies

During the COVID-19 pandemic, many people in many countries, as well as in Latvia, lived outside the cities, managing their daily processes from villages, small towns or homesteads. Starting from 13 March 2020, many people in Latvia moved from cities to areas outside the cities or small towns and there was a need to ensure both high-quality internet connection and its availability. Figure 4 shows the migration of people from large cities to rural areas by analysing the mobile network connection. A study conducted at the University of Latvia in cooperation with Latvia Mobile Network operator shows that it is possible to provide remote connection in Latvia in practically all areas that are not related to physical production. Figure 4 shows mobile activities in the mobile network before COVID-19, i.e., the change in activity in March 2019 compared to March 2020. To analyse these two periods before and during the first wave of COVID-19 in Latvia, we see the activities change from cities to rural areas [1; 5; 10].

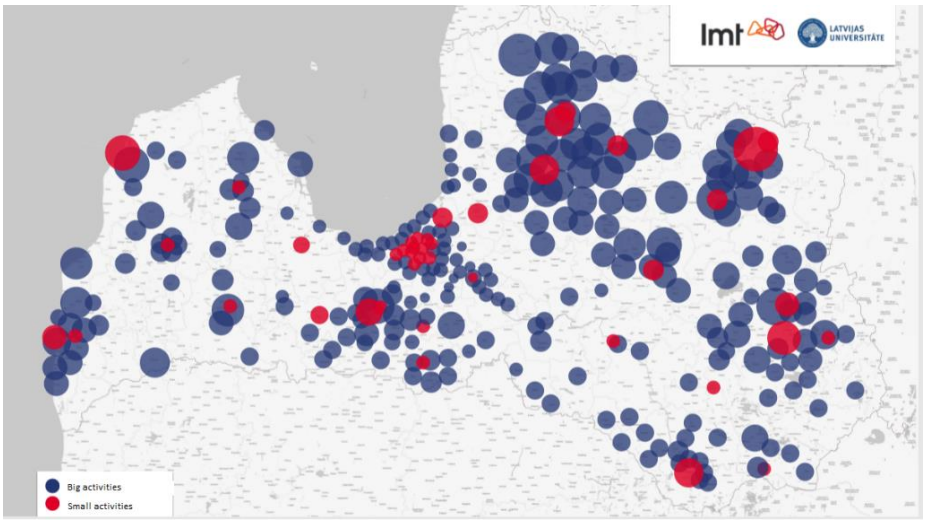


Fig. 6. Activities in the mobile network provided by Latvia Mobile Network [10]

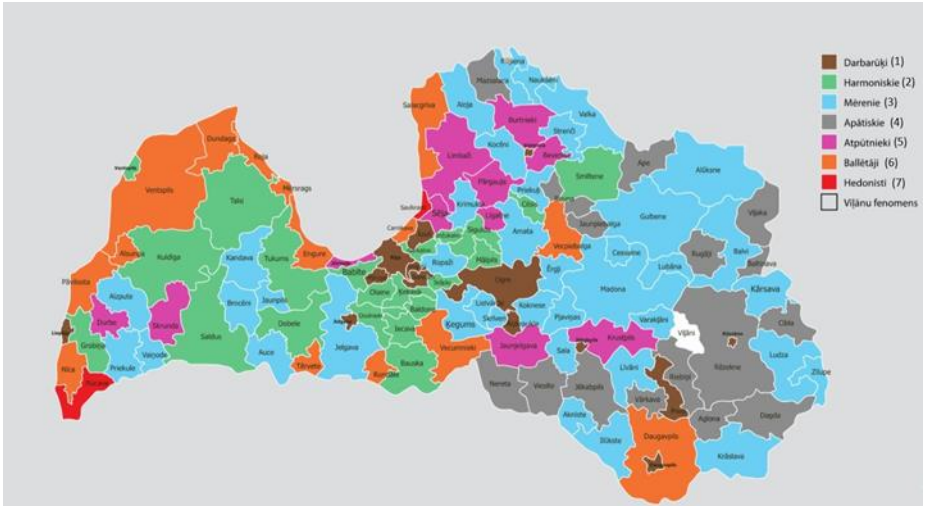


Fig. 7. Economic development index of Latvia's regions (in the Latvian language) [5]

Figure 6 shows that in the Latvian capital, Riga, and other major cities of Latvia, the mobile network activity decreased in March 2019 (before COVID-19) (red circles), but in rural areas, the mobile network activity increased in March 2020 (during COVID-19) (blue circles). Thus, it can be concluded that if there is a sufficient IT infrastructure and the work can be done remotely, then people move to the countryside, outside large cities, as well as to the villages.

Researchers of the University of Latvia analysed data of mobile network (LMT) events (incoming and outgoing calls and SMS) over the period from 25 July 2015 to 20 January 2017 (64733760 entries) and, according to mobile phone usage habits, an index map for the economic development of Latvia's regions was created (see Figure 7).

As can be seen in Figure 5, all regions of Latvia were classified into eight groups:

(1) – workaholic, denoting community members with high activity on weekdays and moderately low activity on weekends;

(2) – harmonious, denoting community members with high and moderate activity on weekdays and moderate activity on weekends;

(3) – moderate, denoting community members with moderate economic activity on weekdays and weekends;

(4) – apathetic, denoting community members with low activity on weekdays and moderate activity on weekends;

(5) – holidaymakers, denoting community members with moderately low activity on weekdays and moderately high activity on weekends;

(6) – partygoers, denoting community members with low activity on weekdays but high activity on weekends;

(7) – hedonists, denoting community members with minimal activity on weekdays and maximum activity on weekends;

(8) – Viļāni phenomenon (only one municipality has these characteristics) denoting the activity of the area as moderate on weekdays and moderately low on weekends.

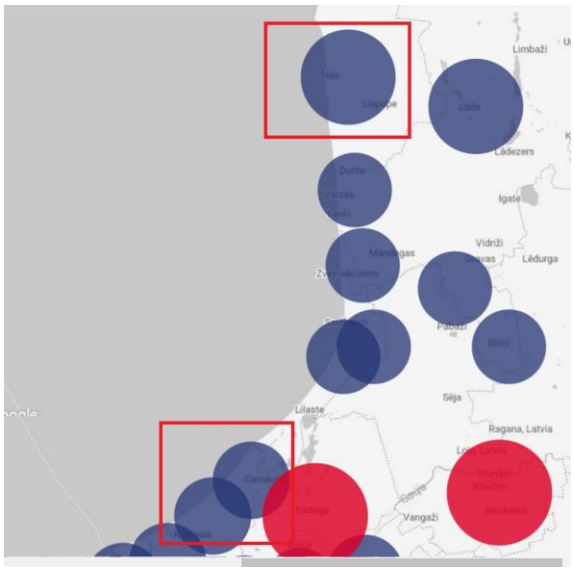


Fig. 8. Changes in the economic activity index in March 2020 compared to March 2019 in Tūja village of Salacgrīva district and Garupe village of Carnikava district [10]

To better reflect the changes in the economic activity index during the first period of COVID-19 and to show the activity of villages, the authors demonstrate two Latvian village profiles as example territories in Figure 8 – Tūja village in Salacgrīva district and Garupe village in Carnikava district, where both villages correspond to the profile of partygoers according to the above classification, which means that before the COVID-19 people were active on weekends in these villages.

The information presented in Figure 6 about Tūja village in Salacgrīva district and Garupe village in Carnikava district, which according to the classification provided in Figure 5 correspond to the *profile of partygoers* before the COVID-19, shows that when the first state of emergency came into force people moved to rural areas, where they lived and worked, including more active former *partygoer* villages of Tūja and Garupe transformed from *partygoers* to *workaholic*.

Another mobile network provider Tele2 conducted a survey of the people. The population survey was conducted in cooperation with the research company BERG Research. The survey took place from 27 March to 1 April 2020, and 707 respondents participated. The consumption of data by telephones in Tele2 network increased by 50% in the first half of 2020. The average consumption of mobile data per SIM card in the network of the mobile operator Tele2 increased by 50 % in the first half of 2020. According to Tele2, the average data consumption per SIM card in the company's network reached 15.2 gigabytes (GB). The company also mentions that a rapid average increase in data consumption by smartphones has been since the beginning of 2020, but an increase in data consumption has not only been affected by the spread of coronavirus and restrictions to combat it, as the population's habits change. "Data consumption continues to grow year by year. We see this both after the average data consumption and the increase in the number of connections of unlimited tariff plans. Unlimited data plans are currently the most popular," said Valdis Vancovičs, Chairman of the Board of Tele2 [19].

Analytical Assessment of Socioeconomic Activities

Not only experimental but also official information collected by the Central Statistical Bureau shows the impact of COVID restrictions on employees' behaviour and economic activity.

The employed population, who had the opportunity, switched to remote work. Figure 9 shows proportion of remote employees by the main economic activity sectors: *manufacturing sector* (NACE section B–F (B – Mining and quarrying, C – Manufacturing, D – Electricity, gas, steam and air conditioning supply, E – Water supply, sewerage, waste management and remediation activities, F – Construction)), *trade and services sector* (NACE section G–N (G – Wholesale and retail trade; repair of motor vehicles and motorcycles, H – Transportation and storage, I – Accommodation and food service activities, J – Information and communication, K – Financial and insurance activities, L Real estate activities, M Professional, scientific and technical activities, N – Administrative and support service activities)), *other service sector* (NACE section O – U (O – Public administration and defence, compulsory social security, P – Education, Q – Human health and social work activities, R – Arts, entertainment and recreation, S – Other service activities, T – Activities of households as employers, undifferentiated goods- and services-producing activities of households for own use, U – Activities of extraterritorial organisations and bodies)) [17].

According to Figure 7, remote work in some economic activity sectors can be implemented quickly and successfully, but in others – such as in non-automatized manufacturing – not.

The data of the Central Statistical Bureau show that senior specialists worked most often (42.7 %) remotely, slightly more than a third (34.2 %) of managers and slightly less than a third (32.4 %) of specialists. In June 2020, 63.7 % of remote employees worked full-time, 18.3 % worked regularly 3–5 days a week, and 7.8 % worked regularly 1–2 days a week. 5.2 % of employees worked remotely a few days a month, but 5.0 % regularly worked part-time or a few hours.

With the end of the state of emergency (the first wave) in Latvia, the proportion of remote employees decreased. In June 2020, 15.5 % (117.1 thousand) of employees aged 15–74 worked remotely, which was

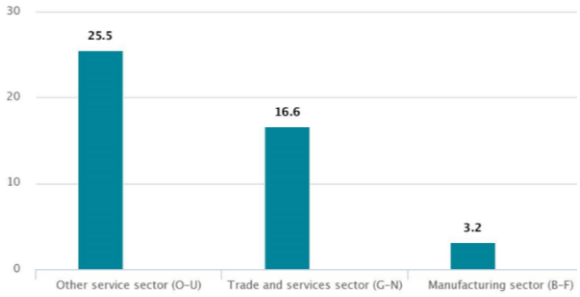


Fig. 9. Proportion of remote employees by economic activity sector in June 2020 (as per cent) [17]

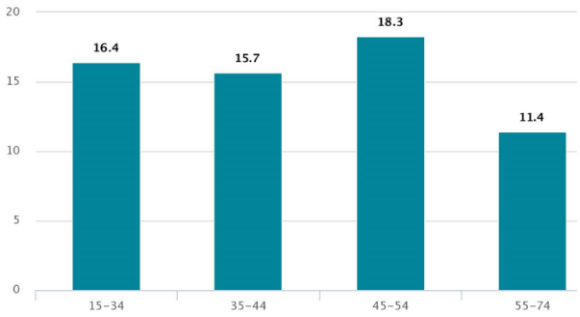


Fig. 10. The proportion of remote employees to the total number of employees of the corresponding age group in June 2020 (as per cent) [6]

2.7 percentage points (18.8 thousand) less than in May 2020, according to the results of the Labour Force Survey conducted by the Central Statistical Bureau. 70% of women and 30% of men worked remotely [6].

The highest number of remote employees was in the age group 15–34 years (31.2 %), slightly less (27.0 %) – in the age group 45–54 years (see Figure 10). The highest number of remotely employed men (35.7 %) was in the age group 35–44 years, but women (31.7 %) – in the age group 15–34 years.

As shown in Figure 8, the highest share of remote employees (18.3 %) to the total number of employees in the corresponding age group in June 2020 was observed in the age group 45–54 years, but the lowest (11.4 %) in the age group 55–74 years. In June 2020, 63.7 % of remote employees worked full-time, 18.3 % worked regularly 3–5 days a week, and 7.8% worked regularly 1–2 days a week. 5.2 % of employees worked remotely a few days a month, but 5.0 % – regularly part-time or a few hours [6].

The authors of the study admit that probably a relatively large share of remote employees in the age group 45–54 years is related to the fact that this group has the largest number of senior specialists employed.

Figure 11 shows that with the end of the state of emergency (the first wave) in Latvia, the confidence indicators seasonally started to go up, but very slow in all sectors.

The authors also note that the COVID-19 has certainly had an impact on employee behaviour and economic performance of companies, but it is currently difficult to predict whether it will be a "yo-yo" or a long-term effect.

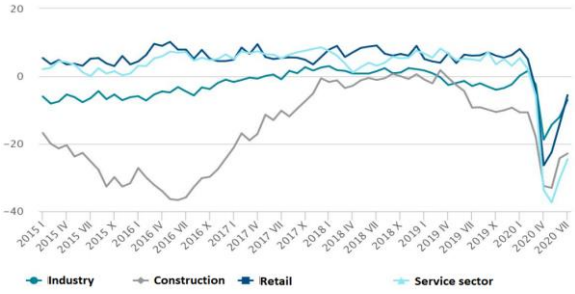


Fig. 11. Confidence indicators – seasonally adjusted data, balance % [6]

Discussion

In the discussion part, it is important to understand whether the SMART and strong community can help overcome periods of crisis.

Open questions:

Will people and services stay in the countryside or return to the city after the end of the COVID-19 restrictions (see Figure 12)?

What tools are needed for successful operation remotely and can the Smart Village concept help?

Can a Smart and strong village or a community with a higher level of development better overcome crisis situations?

Dr. Bernie Jones discusses the Smart Village concept, "Unfortunately, in the world today, there are still around 1 billion people without access to electricity. 3 billion are still cooking on dangerous and inefficient stoves. Many of them live in remote rural communities. Until such communities have access to modern energy services, little progress can be made to develop their economies and improve their lives" (see Figure 10) [11].

In Latvia, from a digital point of view, there are no significant obstacles for communities and institutions to manage and communicate in digital format. Villages need mutual cooperation with each other and also among institutions. Cooperation would ensure both the identification of resources and the planning of the provision of missing resources.

The daily life of example coastal villages is based on a tourist service or a place of rest outside the city. Smart services successfully provide resource management, business activities, cultural event promotion, and bulletin board features.

The open question is whether social life can be provided remotely for a long time and where the reality remains – social and cultural activities?

To get a "full picture" of activities of communities and villages in the time of COVID-19 pandemic, it is important to combine concepts of Smart Village and strong community, which is based on the interaction scale (see Figure 2), because digital solutions cannot be assessed without taking into account the factors of human cooperation.

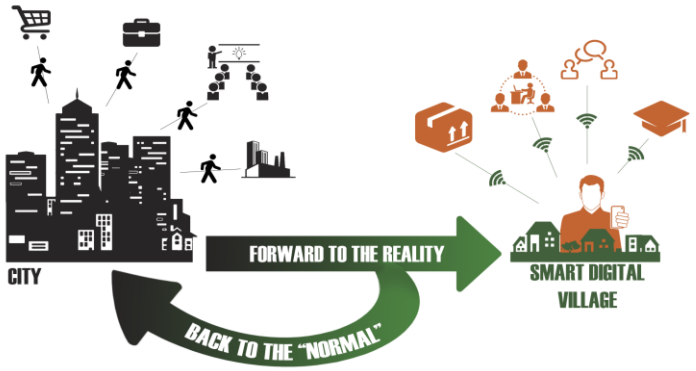


Fig. 12. Changes caused by the COVID-19 restrictions [developed by the authors]

TABLE 1

Advantages of Smart Villages and Strong Communities in the Time of Covid-19 Pandemic [developed by the authors]

Covid-19 pandemic restriction field	Village or community groups (citizens, entrepreneurs, local administration) affected	Smart village concept and community interaction strengths as a reaction to restriction
Restriction of **public transport** or suspension of service	Citizens, especially those who use public transport to get to work and services	Teleworking opportunities, which, despite restrictions, allowed for teleworking and remuneration IT tools to ensure mutual public cooperation in private transport sharing
Restriction of **education services** or suspension of service	Citizens as recipients of services Entrepreneurs as parents of children Municipalities as service providers	There were many different IT and TV tools implemented to provide distance learning with the least possible impact on the quality of education Sufficient quality of the Internet and the number of computers allowed working and studying remotely within one household at the same time, which influenced business as little as possible
Restriction of **culture services** or suspension of service	Citizens as recipients of services Municipalities as service providers	There were many different IT and TV tools implemented to provide distance culture services, as well as creative amateur processes as far as possible
Restrictions of **health care services** or suspensions of service	Citizens as recipients of services Entrepreneurs as parents of children Municipalities as service providers	Various solutions based on telephone services and IT services were introduced, which allowed receiving services remotely without gathering and moving. At the same time, it should be noted that in the health sector only some services are provided as e-health services due to their specifics
Self-isolation and quarantine, a total ban on moving outside the place of residence	Citizens as individuals subject to self-isolation or quarantine Entrepreneurs as employers	Self-help opportunities, focusing on the ability to provide help and support to self-isolated or infected community members through remote (non-contact) tools and a strong cohesive community (this pandemic forced almost everyone to self-isolation or treatment at home)
Prohibitions on gathering in public places, including socialization points (e.g., cafes)	Citizens as beneficiaries Entrepreneurs as service providers	In Latvia, the tourism and service sector had the opportunity to attract more local market, which in the long run would have an impact on habits –tourism and recreation were also possible in the local region and in Latvia as a whole (safe) IT tools for meetings of interest groups
Restrictions on the **provision of day-to-day services**	Citizens as beneficiaries Entrepreneurs as service providers	There was an opportunity for a rapid reorientation of direct sales to digital sales with contactless supplies, both in the services and trade sectors
Recommendation to **work remotely**, mass infection at workplaces	Residents as employees Entrepreneurs as employers	Opportunity to work remotely by using IT tools due to limited access to public transport for employees, limited access to work due to children having to learn from home, including a reduced risk of cross-contamination among employees

To answer open questions stated before, the authors of the study have collected information on how Smart and strong community strengths have affected the community/village ability to respond to restrictions and problems caused by COVID-19 pandemic in Latvia (see Table 1).

The information analysed in the study showed that in the conditions of the COVID-19 pandemic, there was a change in the habits of society as well as a change of residence to areas outside cities, and it was acknowledged that society was largely ready to switch to remote work and distance learning. Summarising information on changing population habits, national restrictions, and the strengths of the SMART village concept, it was identified that there were significant benefits for SMART villages and communities, as the local community chose a digital development path long ago; therefore, adapting to remote work, distance learning, cultural and public services did not cause many inconveniences. At the same time, the society was able to continue mutual communication and organise self-help. A big open question for post-Covid research remains: will people who chose to move out of the city during the pandemic choose to stay in the countryside or return to the city? This can make significant adjustments to the development of local communities in both potentially positive and negative ways.

Conclusion

From the above information and the data collected, it can be concluded that digital skills, digital equipment and services of local communities, as well as community cooperation skills have played a key role in overcoming the limitations and consequences of the COVID-19 pandemic. Smart villages and communities, as well as previously strong communities, were much better prepared for the crisis because they knew and were able to switch to digital solutions in different living spaces, as well as to provide mutual self-help.

Given the fact that smart communities and strong communities are usually closely linked to their living space and have purposefully chosen to live in small villages, it is considered that providing equivalent services even in the event of a large pandemic could not be a basis for change of the place of residence or business.

Examining the limitations of the pandemic and the communities' responses to them, it was concluded that smart communities, entrepreneurs, public service providers were able to adapt to a wide range of tools – IT solutions and applications, telephone-based services, social networks, online stores, etc. This is important evidence that IT infrastructure, networking and capacity, as well as digital connectivity and interoperability have been instrumental in overcoming the COVID-19 crisis.

In final conclusion, smart communities and strong communities were much more able to adapt to the constraints of the COVID-19 pandemic and to overcome the effects of the pandemic, as digital skills and strong community self-help played a key role.

Funding: This research was funded by the INTERREG Central Baltic programme project "Coast4us" within the P2 project priority – Sustainable use of the common resources, project number 627.
Conflicts of Interest: The authors declare no conflicts of interest.

References

1. **Arhipova, I., Berzins, G., Brekis, E.,** et al. Pattern Identification by Factor Analysis for Regions with Similar Economic Activity Based on Mobile Communication Data. *In: Arai K., Kapoor S., Bhatia R. (eds) Advances in Computing Networks*, AISC, Springer, 2019, vol. 886, p. 561-569. https://doi.org/10.1007/978-3-030-03402-3_39
2. *Business models for rural services*. Briefing Working document. The European Network for Rural Development. European Commission. https://enrd.ec.europa.eu/sites/enrd/files/tg_smart-villages_briefing_business-models.pdf (accessed on 21.07.2020.)
3. *Coronavirus disease (COVID-19) advice for the public.* World Health Organization. Available online: https://www.who.int/emergencies/diseases/novel-coronavir.Regarding Declaration of the Emergency Situation us-2019/advice-for-public (accessed on 10.08.2020).
4. *Digital and Social Innovation in Rural Services.* The European Agricultural Fund for Rural Development. The European Network for Rural Development. European Commission. Available online https://enrd.ec.europa.eu/sites/enrd/files/enrd_publications/publi-eafrd-brochure-07-en_2018-0.pdf (accessed on 21.07.2020.)
5. *Economic development index of Latvian regions.* LU BVEF. LMT. 2019. Available online: https://www.lps.lv/uploads/docs_module/1_Latvijas%20reģionu%20ekonomiskās%20attīstības%20indekss.pdf (accessed on 21.07.2020).
6. *Employees working remotely.* Socio-economic indicators under the impact of Covid-19. Central Statistical Bureau of Latvia. Available online: https://www.csb.gov.lv/en/statistics/covid19/Employees-working-remotely (accessed on 10.08.2020).
7. *EU Action for Smart Villages.* European Commission. Available online: https://ec.europa.eu/info/sites/info/files/food-farming-fisheries/key_policies/documents/rur-dev-small-villages_en.pdf (accesed on 21.07.2020)
8. **Haider, M. F., Siddique, A., R., Alam, S.** An approach to implement frees space optical (FSO) technology for smart village energy autonomous systems. *In: Far East. J. Electron. Commun.* 2018, 18, 439–456. [CrossRef]
9. *How California's communities can thrive in the digital age: Smart communities guidebook.* San Diego State University. Center for International Communications, California. Department of Transportation. 1997. 33 p.
10. *Impact of the implementation of emergency measures on the behaviour of mobile users.* LU. LMT. Available online http://lmt.mstatic.lv/lmt/files/2020/lu-lmt-petijums-/pezentacija.pdf (accessed on 21.07.2020).

11. *New thinking for off-grid communities worldwide.* Smart Villages Research Group. Available online: https://e4sv.org/svrg-home-page/about-us-2/. (accessed on 10.08.2020).
12. *Priority & Focus Area Summaries.* Connecting Rural Europe. The European Network for Rural Development. European Commission. https://enrd.ec.europa.eu/policy-in-action/rural-development-policy-figures/priority-focus-area-summaries_en (accessed on 21.07.2020)
13. **Pudzis, E., Geipele, S., Geipele, I.** Community Participation in Village Development: the Scale of Latvia. *Baltic Journal of Real Estate Economics and Construction Management*, 2016, 4(1), p. 84-99. https://doi.org/10.1515/bjreecm-2016-0007
14. *Regarding Declaration of the Emergency Situation.* Cabinet Order No. 103. Adopted 12 March 2020. Legal Acts of the Republic of Latvia. Available online: https://likumi.lv/ta/en/en/id/313191 (accessed on 10.08.2020).
15. *Smart Villages – how to ensure that digital strategies benefit rural communities.* European Network for Rural Development. Available online: https://enrd.ec.europa.eu/sites/enrd/files/enrd_publications/smart-villages_orientations_digital-strategies.pdf (accessed on 10.08.2020).
16. *Smart Villages.* The Pilot Project. Briefing note Brussels, 21-22 February 2019. Available online: https://digitevent-images.s3.amazonaws.com/5c0e6198801d2065233ff996-registrationfiletexteditor-1551115459927-smart-villages-briefing-note.pdf (accessed on 21.07.2020)
17. *Statistical classification of economic activities in the European Community.* NACE Rev. 2. Methodologiesand Working papers. Eurostat. Available online https://ec.europa.eu/eurostat/documents/3859598/5902521/KS-RA-07-015-EN.PDF (accessed on 21.07.2020)
18. **Thomas, D.** Community Development at Work: A Case of Obscurity in Accomplishment. London: Community Development Foundation. As cited in Meegan, R., Mitchell A., 2001. It's Not Community Round Here, It's Neighbourhood: Neighbourhood Change and Cohesion in Urban Regeneration Policies. *Urban Studies,* 1991, 38(12), p. 2167-2194.
19. *Workin remotely in Latvia.* Tvnet/Leta. 08.04.2020. Available online: https://www.tvnet.lv/6944989/vairak-neka-pusei-latvijas-iedzivotaju-arkarteja-situacija-ir-lauts-stradat-attalinati (accessed on 21.07.2020).

AUTHORS:
Edgars Pudzis, Mg.Sc.Ing., MgPM, Researcher; PhD student; Riga Technical University, Institute of Civil Engineering and Real Estate Economics; 1 Kalku Street, Riga, Latvia, LV−1658; E−mail: edgars.pudzis@rtu.lv
Una Krutova, Mg.Sc.Ing., Lecturer, Researcher; PhD student; Riga Technical University, Department of Geomatics; 1 Kalku Street, Riga, Latvia, LV-1658; E−mail: una.krutova@rtu.lv
Sanda Geipele, Dr., Associated Professor, Lead Researcher; Riga Technical University, Institute of Civil Engineering and Real Estate Economics; 1 Kalku Street, Riga, Latvia, LV−1658; E−mail: sanda.geipele@rtu.lv
Māris Kaļinka, Dr.Sc.Ing., Associated Professor, Lead Researcher; Riga Technical University, Department of Geomatics; 1 Kalku Street, Riga, Latvia, LV−1658; E−mail: maris.kalinka@rtu.lv
Armands Auziņš, Dr., Associated Professor, Lead Researcher, Riga Technical University, Institute of Civil Engineering and Real Estate Economics; 1 Kalku Street, Riga, Latvia, LV−1658; E−mail: armands.auzins@rtu.lv

Kopsavilkums. COVID-19 pandēmija ir izraisījusi dažādas izmaiņas ikviena cilvēka dzīvē. Pētījumā analizētas ciematos un lauku teritorijās dzīvojošo cilvēku izveidotās viedās kopienas. Tiek analizēti gan ārējie faktori, kas ietekmē šādu kopienu darbību, gan arī īpašie apstākļi, ko izraisīja COVID-19 pandēmijas pirmā viļņa periods (no 2020. gada marta līdz 2020. gada jūnijam). Apkopojot pamatinformāciju par viedajām kopienām, ārējiem faktoriem un īpašajiem apstākļiem, kā arī izmantojot matemātiskās analīzes un salīdzināšanas metodes, pētījuma ietvaros tiek atzīmēti faktori, kas pandēmijas apstākļos ir pozitīvi ietekmējuši kopienu veidošanos, skaidri norādot viedo kopienu ilgtspēju un attīstības priekšrocības Latvijā.