



NACIONALNA KONFERENCIJA
SA MEĐUNARODNIM UČEŠĆEM
ZELENA GRADNJA 2024

NIŠ, SRBIJA, 5. JUN 2024.,
GRAĐEVINSKO-ARHITEKTONSKI FAKULTET UNIVERZITETA U NIŠU

ZBORNİK RADOVA

PROCEEDINGS

NATIONAL SCIENTIFIC CONFERENCE
WITH INTERNATIONAL PARTICIPATION
GREEN BUILDING 2024

NIŠ, SERBIA, 5TH OF JUNE 2024,
FACULTY OF CIVIL ENGINEERING AND ARCHITECTURE UNIVERSITY OF NIŠ

**Nacionalna konferencija sa
međunarodnim učešćem
ZELENA GRADNJA 2024**

ZBORNİK RADOVA



**Građevinsko-arhitektonski fakultet Niš, Srbija
05. jun 2024.**

**National Scientific Conference with
International Participation
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**Faculty of Civil Engineering and Architecture Niš, Serbia
5th of June 2024**



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UNIVERZITETA U NIŠU

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TEMATSKE OBLASTI

- BOKLIMATSKA ARHITEKTURA
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- ZELENA GRADNJA
- EKOLOŠKI URBANIZAM
- URBANA PLAVO-ZELENA INFRASTRUKTURA
- SISTEMI ZA PROCENU ODRŽIVOSTI
- INFORMACIONO MODELIRANJE ZGRADA (BIM)
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- URBANISTIČKO I ARHITEKTONSKO PROJEKTOVANJE – TEORIJA I PRAKSA
- DIZAJNERSKI I INŽENJERSKI PRISTUPI PAMETNIM I OTPORNIM GRADOVIMA
- PRINCIPI EKOLOŠKOG DIZAJNA I IZGRADNJE
- EKOLOŠKI PRIHVATLJIVI MATERIJALI U GRAĐEVINARSTVU I ARHITEKTURI
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- CIRKULARNO INŽENJERSTVO



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CONFERENCE TOPICS

- BIOCLIMATIC AND BIOPHILIC ARCHITECTURE
- ENERGY AND ENVIRONMENTAL DESIGN
- GREEN BUILDING
- ECOLOGICAL URBANISM
- URBAN BLUE-GREEN INFRASTRUCTURE
- SUSTAINABILITY ASSESSMENT SYSTEMS
- BUILDING INFORMATION MODELING (BIM)
- CLIMATE CHANGE CHALLENGES IN ENGINEERING AND ENVIRONMENTAL IMPACT
- URBAN AND ARCHITECTURAL DESIGN - THEORY AND PRACTICE
- DESIGN AND ENGINEERING APPROACHES TO SMART AND RESILIENT CITIES
- PRINCIPLES OF ECO-FRIENDLY DESIGN AND CONSTRUCTION
- ECO-FRIENDLY MATERIALS IN CIVIL ENGINEERING AND ARCHITECTURE
- NATURE-BASED SOLUTIONS IN WATER MANAGEMENT
- CIRCULAR ENGINEERING



PREDGOVOR

Osnovni cilj konferencije Zelena gradnja 2024 (Green Building 2024) je predstavljanje savremenih naučnih i praktičnih dostignuća u arhitekturi, urbanizmu i građevinarstvu u oblasti ekološke, energetske, socijalne i ekonomske održivosti zgrada, izgrađenog okruženja i gradova, a u kontekstu jačanja otpornosti na klimatske promene, ubranu urbanizaciju i ostale aktuelne globalne izazove. U skladu sa ciljem, definisane su i tematske oblasti Konferencije. Bez obzira na okolnost da je organizacija Konferencije morala da se obavi u veoma kratkom vremenskom periodu, mislimo da smo zahvaljujući ličnom, ali i Vašem angažovanju kao autora, uspeli u tome.

Namera organizatora je bila da obezbedi učešće domaćih i inostranih eminentnih stručnjaka u oblasti održive (grado)gradnje, ali i da privuče i okupi zainteresovane projektante, inženjere, studente, preduzetnike, društveno odgovorne kompanije i pojedince, koji prepoznaju značaj primene prezentovanih saznanja i rešenja iz domena tematskih oblasti Konferencije.

Pored odaziva autora za predavanja po pozivu (radova po pozivu), za učešće na Konferenciji je prijavljeno oko 60 radova, od čega je desetak iz inostranstva. Svi radovi su recenzirani (po modelu „*single-blind review*“) od strane recenzenata sa naučnim zvanjem doktora nauka iz tematske oblasti za koju je rad prijavljen. Imena svih recenzenata su navedena na kraju Zbornika. Prihvaćeni radovi su publikovani u celosti u Konferencijskom Zborniku, čineći ga tako bogatim i sadržajnim izdanjem. Sa nestrpljenjem iščekujemo i nadamo se njihovom prezentovanju na Konferenciji.

Nadamo se da će radovi koji naglašavaju znanja i ideje u arhitekturi, urbanizmu i građevinarstvu (u oblastima Konferencije) doprineti daljoj promociji naučnih saznanja i dostignuća, primenu inovacionih tehnologija i unapređenju alata za korišćenje baza podataka i iskustava u oblasti tehničkih propisa i preporuka.

Zbog toga želimo da izrazimo svoju beskrajnu zahvalnost svim autorima, kao i recenzentima koji su doprineli poboljšanju i originalnosti rukopisa, na njihovom ogromnom doprinosu uspešnosti ove Konferencije. Vaš nesebični doprinos za uspeh ove konferencije je bio neprocenjiv, zato se nadamo i radujemo se vašem daljem interesovanju.

Urednici Zbornika,
Organizacioni odbor



PREFACE

The main goal of the Green Building 2024 Conference is to present contemporary scientific and practical achievements in architecture, urban planning, and construction in the fields of ecological, energy, social, and economic sustainability of buildings, the built environment, and cities, all in the context of enhancing resistance to climate change, rapid urbanization, and other current global challenges. In accordance with the goal, the thematic areas of the Conference were defined. Even though the organization of the Conference had to be done in a very short period, thanks to your involvement and engagement as the author, we successfully accomplished it.

The organizers aimed to ensure the participation of eminent domestic and foreign experts in the field of sustainable (urban) construction but also to attract and gather interested designers, engineers, students, entrepreneurs, socially responsible companies, and individuals who recognize the importance of implementing the presented knowledge and solutions from the domain of the thematic areas of the Conference.

In addition to the response of authors for lectures by invitation (papers by invitation), about 60 papers have been submitted for participation in the Conference, ten of which were from abroad. All papers were reviewed (according to the "single-blind review" model) by reviewers with the scientific title of Doctor of Science from the subject area for which the paper was submitted. The names of all reviewers are listed at the end of the Proceedings. Accepted papers have been published, in their entirety, in the Conference Proceedings, thus creating a rich and informative edition. We look forward to and hope for their presentation at the Conference.

We hope that works that emphasize knowledge and ideas in architecture, urban planning, and construction (in the areas of the Conference) will contribute to the further promotion of scientific knowledge and achievements, application of innovative technologies, and improvement of tools for using databases and experiences in the field of technical regulations and recommendations.

Editors of the Proceedings,
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ECO-FRIENDLY OPEN SPACE DESIGN IN NEW BUILT MULTI-FAMILY HOUSING ESTATES: A SHORT OVERVIEW FROM THE BALTIC COUNTRIES

Ljiljana Vasilevska¹, Jelena Živković²,
Magdalena Slavković³

Abstract *After the political changes in the early 1990s, a new post-socialist reality was formed in the cities of the Baltic countries - Estonia, Latvia and Lithuania. It is characterized by changed institutional planning conditions, which are reflected in changes in housing and urban policy. New types of multi-family housing led by private investors are emerging, in which open spaces are treated in different approaches. One of them is eco-friendly approach, which brings with it numerous benefits. In order to recognize the possibility of its applying in our planning practice, the aim of this research is to examine the modes and benefits of applying eco-friendly open space design, based on analysis of selected multi-family housing estates of the Baltic cities.*

Key words: *Eco-friendly design, open space, multi-family housing, Baltic countries*

EKOLOŠKI DIZAJN OTVORENIH PROSTORA U NOVIM VIŠEPORODIČNIM STAMBENIM PODRUČJIMA: KRATAK PREGLED IZ BALTIČKIH ZEMALJA

Apstrakt *Nakon političkih promena početkom 1990-ih, u gradovima baltičkih zemalja – Estoniji, Letoniji i Litvaniji, formirala se nova post-socijalistička urbana realnost. Karakterišu je izmenjeni institucionalni i planerski uslovi, koji se ogledaju u promenama u stambenoj i urbanoj politici. Oni su, između ostalog, doveli i do pojave novih tipova višeporodičnog stanovanja koji su vođeni privatnim investicijama. U njima se otvoreni prostori tretiraju na različite načine. Jedan od njih je primena ekološki zasnovanog dizajna, koji sa sobom nosi brojne prednosti. Kako bi se prepoznala mogućnost njegove primene u našoj praksi planiranja, cilj ovog istraživanja je da se ispituju načini i prednosti primene ekološki prijateljski nastrojenog i zasnovanog dizajna otvorenih prostora, a na osnovu analize odabranih novoizgrađenih višeporodičnih stambenih područja u baltičkim gradovima.*

Ključne reči: *Ekološki zasnovan dizajn, otvoreni prostor, višeporodično stanovanje, Baltičke zemlje*

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1. INTRODUCTION

The Baltic states or the Baltic countries is a geopolitical term encompassing Estonia, Latvia, and Lithuania, three countries which are situated on the eastern coast of the Baltic Sea. Former republics of the USSR (from 1944 to 1991), all three countries are members of the European Union, the Eurozone, NATO and the OECD since 2004. The World Bank classified them as high-income economies with a very high Human Development Index. The three governments engage in intergovernmental and parliamentary cooperation. There is also frequent cooperation in foreign and security policy, defence, energy, and transportation.

During the Soviet-era, the Baltic countries enjoyed somewhat higher living standards and exhibited greater openness to Western influences than other union republics, which made Estonia, Latvia and Lithuania attractive to economic migrants from other parts of the USSR [1]. They significantly transformed the ethnic composition of the urban population in the Baltic countries and influenced on increase of housing demand. In order to create new housing models which reflect political ideology and respond the growing housing demand, the housing and urban policy in the USSR, which were based on rigid centralized urban planning and standardized mass housing production, led to the intensive construction of modernist large housing estates (from here on, LHEs) in the Baltic countries as well [2]. The largest number of them were based on the application of the urban principles of international style, which included generously dimensioned public open spaces (from here on, POS).

After the political changes in the early 1990s, a new urban reality was formed - the reality of the post-socialist city. As in the case of other former socialist countries, it was also characterized in the Baltic countries by changed institutional and planning conditions, which were reflected in changes in housing and urban policy and the transition to market-oriented housing production. New types of multi-family housing led by private developers emerged, in which POS are treated in different ways, both in relation to the Soviet era and in between - from neglect, loss, to their active participation in the physical-functional structure and landscaping of newly built multi-family housing estates.

There are also different approaches to the design of open spaces within private housing developments, where one of them is eco-friendly design approach. In addition to the analysis of the modes of open spaces treatment in new multi-family housing, the aim of this research is to examine the benefits of applying eco-friendly open space design in order to recognize the possibility of its application in Serbian planning practice. The research is based on the analysis of the current housing and urban policy of the Baltic countries, as well as the analysis of selected newly built residential area Uus-Veerenni in Tallinn, Estonia.

2. NEW MULTI-FAMILY HOUSING – SETTING THE CONTEXT

With certain differences, most housing development trends in post-socialist period were common to all three Baltic countries. The capital's growth and sprawl processes were followed by polarization and socio-spatial segregation



in times of neo-liberal economic policy, as well as new types of housing which was driven from profit-oriented private developers. After the initial fundamental reforms, the global neoliberal agenda has accompanied the evolvement of housing policies and urban planning in post-socialist Estonia, Latvia and Lithuania. Urban planning in metropolitan areas has been focused on planning new up-market housing segments such as the formation of new suburban districts, infill projects and revitalisation of inner cities, while no strategy has been put in place to address the decline of inherited, in the meantime, post-privatized large housing estates or affordable/social housing.

The real estate market for sale or rent, driven by private developers, experienced a boom in the beginning of 2000s [3]. All three countries had enjoyed a relatively strong economic growth between 2000 and 2006, and the real estate sectors had performed well since 2000, especially in their capitals. The crisis in real estate market - so called "housing bubble in the Baltic states" eventually hit all of them in 2007 due to the financial and economic crisis in 2007-08. As the economy clawed back from recession, recovery of housing sector in the Baltic countries began from 2010. In the last decade, around 2,500-2,800 new apartments have been built in Tallinn (Estonia) every year, around 2,200-2,600 in Riga (Latvia), and around 4,000-4,400 in Vilnius (Lithuania) [3].

Although there are a significant number of new housing estates whose open spaces are available to everyone, the appearance and evolution of gated communities is also noticeable. However, compared to other post-socialist countries (for example, the Czech Republic, Hungary, Poland or Russia), their emergence in the Baltic countries was late.

Different strategies and modes related to new housing development were implemented, which created diverse urban environment and different approaches to the open space. However, six modes can be recognized [4]: 1) single project - partial construction of a residential building; 2) small-scale infill development projects within the LHEs (group of buildings on the perimeter or in existing inner courtyards); 3) large-scale infill development projects on empty space - unfinished parts of the LHEs, usually situated on their outskirts; 4) large-scale new residential greenfields projects on the city outskirts; 5) large-scale new residential development projects in inner city; and 6) mix-used small or large scale projects.

3. OPEN SPACE IN NEW MULTI-FAMILY HOUSING

In all three countries, treatment and design of POS in new housing development differ in their physical characteristics and social roles. Three approaches can be recognized: 1) active consideration of POS in the urban-architectural composition of new housing development projects, whether it is the new infill within LHEs or the greenfield development; 2) reduction of POS caused by new infill development within LHEs; 3) loss and disappearance of POS within private developers-driven gated communities, which occur in both infill and greenfields projects location.



While in the first approach capability of POS to generating a range of benefits across economic, social and environmental dimensions [4] is recognized, the last approach leads to its privatization. Although open space in private developments (from here on, POSPD) can increase the amount of urban POS effectively, this is often accompanied by the implementation of strict control and surveillance within these spaces. POSPD are accused of limiting the manifestation of social or ethnic identity, declining in public space quality. In the case of gated communities, appropriation of POS involves limit in public access, which is in contradiction with the rules of modern urban planning, as well as exclusion of inhabitant participation, decrease of socially oriented activities, as well as growing spatial segregation and homogenization of the community and development of spatial barriers. However, the analysis of the recent infill developments showed that four infill development types can be identified - some of them may lead to social isolation and segregation, but some can be considered as a positive examples of open space treatment as they have provided accessibility and benefit to the wider community.

In addition, it is noticeable the presence of new multi-family housing estates that base their reputation precisely on the ecological potential of POSPD [4]. It results from the application of eco-friendly design. The focus of these projects is on inner courtyards, parks and linear open spaces that draw people outside and encourage social interactions, regardless of whether it is a new smaller or larger infill or greenfield development [4].

4. ECO-FRIENDLY OPEN SPACE DESIGN: UUS VEEREENNI KVARTAL IN TALLINN, ESTONIA

Uus-Veerenni kvartal is the largest comprehensive housing development area in central Tallinn. Its construction started in 2018, finished in 2022. In total, it is planned to build about 1,400 new apartments over the next 10-15 years. In addition, a “own village” kindergarten and a business building that enlivens local everyday life are also built [5].

Uus-Veerenni is inspired by Scandinavian urbanism and architecture, which allows contact with nature and opens up views of the courtyards, greenery and beyond. Key element of urban composition, as well as POSPD, are the courtyards (fig 1a, 1b). One of them was awarded due to their eco-friendly solutions and diversity. In 2020, the inner courtyard of stage I of Uus-Veerenni received the Annual Award of the Estonian Association of Landscape Architects in the Category of Courtyard Areas (Fig. 1a) [6]. Together with other types of POSPD, the courtyards provide a complete and comprehensive living environment in order to create a “sense of small-town” surrounded by nature in the heart of the big city (Fig 1). From the start, the focal point in the creation of the Uus-Veerenni has been the human being and its constantly expanding needs and expectations for the surrounding living environment. User-centredness has been a keyword throughout the construction, and this is immediately visible in how the nature of the quarter and what is found there reflect the desires of the residents [5].



Figure 1. Open spaces in Uus-Veerenni kvartal, Tallinn, Estonia.

Source: <https://arhitektuuripreemiad.ee/en/object/the-inner-courtyard-of-uus-veerenni-residential-area/#gallery-2>; <https://merko.ee/en/blog/uus-veerenni-kvartal-terviklik-elukeskkond-kus-fookuses-on-imene>; <https://merko.ee/uus-veerenni/en/apartment/tiu-121/1-korrus/korter-nr-1/>

Another key POSPD is the park with its various playgrounds, relaxation areas, sculptures and public bookcases (Fig. 1b). Completed in December 2022, it was awarded in 2023 with the Annual Award of the Estonian Association of Landscape Architects [6]. The Uus-Veerenni Intermediate park is a plot of land owned by private developers group. Eventually, this area will be developed for residential use, but until then, it will be open to everyone for leisure and recreation instead of being left unused as a vacant lot or fenced-off construction site. Once construction starts, the potted trees and the park's smaller furnishings will be relocated, and the Intermediate park will continue to serve the same purpose in a new location.

The park's landscape design cleverly incorporates materials that could already be found on the site [6]. The concrete floor of the former storage unit has been transformed into a square, the large cladding pieces have been repurposed to create a stepped wall, foundation blocks now serve as benches and concrete boulders stand in for natural ones. Other recycled materials have also been used in the design. In an environmentally responsible approach, residual products from concrete plants, originally to be crushed, have been repurposed as footpaths, sports field boundaries, table tennis tables, steps, grandstands and elements for the bike paths. Additionally, trees with unusual crowns have been planted in construction containers. Recycled artificial materials accumulated on the site over the years, natural elements and new equipment for games and sports are present in the park as equally valuable resources. This fusion creates a multi-layered environment that has something for everyone.

5. CONCLUDING REMARKS

The rapid processes of privatisation and intense institutional and planning changes that have taken place in Estonia, Latvia and Lithuania in beginning of 1990s also had effects on the development, use and maintainence of POSPD. In the years around 2000, there was a boom in housing sector, which resulted in the construction of a large number of private developers driven and market-oriented new housing estates and areas. While some of them are built as gated communities, there is a significant share of new housing areas and complexes



that base their organization, reputation and marketing precisely on the quality of POSPD and the advantages they offer.

It can be concluded that in all three countries, the beginning of the 2010s marks the period when discussions about POS and POSPD began to gain importance. In addition to the support of the different EU funds and networks, new planning and financial instruments are being developed, while the inhabitants increasingly participate in debates and activities related to POS(PD), both in a inherited and newly built housing area. It seems that the Baltic countries are on the way to form urban strategies and planning instruments of sustainable urban development, within which POS(PD) may be targeted on a socially and ecologically sustainable and friendly manner. Therefore, the commitment and success of institutional and planning framework will also determine the future of POS(PD).

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