



RIGA TECHNICAL
UNIVERSITY

Alisa Koroļova

OPEN SPACE TRANSFORMATIONS IN LARGE-SCALE HOUSING ESTATES OF RIGA IN THE POST-SOCIALIST PERIOD

Summary of the Doctoral Thesis



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Faculty of Architecture
Department of Architectural Design

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“Architecture”

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DECLARATION OF ACADEMIC INTEGRITY

I hereby declare that the Doctoral Thesis submitted for the review to Riga Technical University for the promotion to the scientific degree of Doctor of Science is my own. I confirm that this Doctoral Thesis had not been submitted to any other university for the promotion to a scientific degree.

Alisa Koroļova (signature)

Date:

The Doctoral Thesis has been written in English. It consists of Introduction; 3 chapters; Conclusion; 54 figures; 6 tables; 5 appendices; the total number of pages is 124, not including appendices. The Bibliography contains 262 titles.

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INTRODUCTION

Open space in large-scale housing estates forms an important part of the residential environment quality, by providing both necessary, optional and social services, and playing an important role in recreation and recovery from everyday stress. The green open space is a distinctive feature of most large-scale housing estates, and by many residents is perceived as the most valuable feature [49], [127], [162], [143]. Currently, there are various transformations going on in open space. In Latvia, as a starting point of these transformations are changes in political situation in the 1990s, which have led also to transformations in land ownership, open space maintenance and management models, etc. The land reform and property denationalisation in the 1990s [257] has led to the current difficult situation, where the open space in large-scale housing estate is fragmented, owners are different, often the land being in property of private individuals including foreign citizens (or nationals) who are not interested in developing recreational open spaces. At present transformation processes are also influenced by changing economic, ecological and social factors. State and city level strategies aiming at sustainable compact development, pressure from the private sector, global awareness of ecological issues, growing right to the city movement and bottom-up actions, introduction of new governance and city making collaborative models, and other factors are shaping how the open space in large-scale housing estates is perceived, how it functions and develops.

The crucial aspect is the nature of transformations, as they can have both positive and negative impact on the residential environment quality. In case of the negative impact, open space transformations act as a driving motivation for residents to leave the large-scale housing estate, while in the estate remain only those inhabitant groups who, for different reasons, cannot afford to change their residence (e.g. ageing population, social groups with low income, etc.). On the other hand, positive improvements can contribute to the raised property value, and positive inflow of new residents. Currently, bad maintenance, lack of control, undefined spatial organisation and lack of sense of belonging fosters inhabitants' dissatisfaction. For that reason, regeneration of the

outdoor environment, preservation of positive features, and holistic approach to transformation processes should be among preferences to prevent degradation of estates and attract new inhabitants.

In Riga, about 60 % of residents live in large housing estates, so these areas represent an important part of the housing stock [19]. The growing new housing market creates serious competition for large-scale housing estates, thus, increasing the need for strategies to keep the residents interested in large-scale housing estates. As open space in large-scale housing estates now faces various transformations, it is crucial to follow the tendencies of these changes, as they can directly impact residents' decision to move or stay in the neighbourhood [49]. To prevent decay of these areas, the open space transformations should be guided in order to preserve and improve the residential environment quality.

This research is focused on physical transformations in open space of large-scale housing estates. In addition to classification according to the type of transformation and scale, physical changes can be classified according to driving forces and actors involved. Transformations in open space of large-scale housing estates and the residential environment quality cannot be investigated without defining stakeholders who are directly or indirectly involved in the process of these transformations. There is a distinction between externally-led and self-organised engagement in the process of open space transformation.

Previous Research

Previous research is further described according to various topics: open space in residential areas; formation and development of large-scale housing estates [19], [20], [42], [49], [58]; large-scale housing estates in Riga [19], [26], [42]; functioning of open space in large-scale housing estates [34], [58], [117], [122]; quality of urban life [36], [49], [67]; role of public participation in planning and citizen activism, and community building [13], [18]. Some authors discuss changes in the open space of large-scale housing estates; however, so far these studies are fragmented.

Comprehensive research on the character, features and evaluation methods of **open space** was done by various researchers.

Character and features of different public open spaces and open spaces in large-scale housing estates in particular were studied by Professor of Urban Design and the Director of Global Urban Research Unit at Newcastle University Ali Madanipour [34]. Issues related to housing reform, privatization and denationalization have been studied by various researchers [42], [171], issues of insecurity in public open space were analysed by Manuel Aalbers [66]. Richard Sendi, Manuel Aalbers and Marcele Trigueiro have investigated quality of life of the residents in large-scale housing estates and in particular quality of public open space, focusing on the issues affecting social interaction and social cohesion [49, 131–157], [66], [67]. Spatial character of open space in large-scale housing estates was analysed in various studies [75], [133], [138], [191], [149]. The importance of green space was discussed by various researchers from different viewpoints. Despite the fact that not all the planned amenities were built due to budget constraints, various research results show that green open areas are considered among the most valuable features in large-scale housing estates [49]. The explanation of originally planned sanitary-and-hygienic and ornamental planning functions of open space in large-scale housing estates were provided by Vladimir Mashinsky and Elena Zalogina [65]. Characteristic features of large-scale housing estates were defined by Rob Rowlands et al. and other researchers [49], [127], [143]. Sociologist William Whyte conducted great amount of research on social use in public spaces [60]. Some researchers have studied spatial configuration and used *Space Syntax* methodology to analyse functionality of open space in large-scale housing estates [190].

The ideas behind **formation of large-scale housing estates**, reasons and local peculiarities were described and analysed by various authors: Marija Dremaite [11].; Jānis Krastiņš, Ivars Strautmanis, Jānis Dripe [26]; Frank Wassenberg [255]; Eva Oresjo et al. [147]; Henk Heeger [249]; research within the framework of RESTATE project [66], [147], [106], [143], [147], including national reports like Large Housing Estates in Budapest and Nyiregyhaza, Hungary. Comprehensive research on typology of housing with some insights in the formation of the spatial organization was done by Philip Meuser and Dimitrij Zadorin [38].

The history of the **development and current changes of large-scale housing estates** has been investigated by various researchers. Recent book *Housing Estates in the Baltic Countries* is focused on the political, economic and cultural aspects which affected modernist housing estates in the Baltic countries [19]. Contributing authors touch upon ideological and socio-demographic issues which have both fostered the popularity of large-scale housing estates at the time of construction and changes which have led to current situation. Similar approach is described in the book *Housing Estates in Europe: Poverty, Ethnic Segregation and Policy Challenges* [20]. The book represents an extensive collection of research by different authors from Athens, Berlin, Birmingham, Brussels, Bucharest, Budapest, Helsinki, Madrid, Milan, Moscow, Paris, Prague, Stockholm, and Tallinn [20]. The authors analyse origins, current situation, and the development trajectories of large housing estates. The collection of studies in *Mass Housing in Europe: Multiple Faces of Development, Change and Response* also focus on residential satisfaction and different aspects of large-scale housing estates through the lens of social sustainability [49]. Ronald van Kempen, Karien Dekker, Stephen Hall and Ivan Tosics have edited the collection of national studies which describe current transformations in large-scale housing estates [58]. Reflections on urban planning in post-socialist countries are edited by Marina Dmitrieva and Alfrun Kliems [25]. Post-war architecture in Sweden is researched by Claes Caldenby [85].

There has been a lot of research representing **critique of large-scale housing estates and critique of open space** in particular. Starting from failed ideas of modernist urban planning, and then focusing on negative features of large-scale housing estates both external spacial organisation and housing itself, social consequences, crime and vandalism were the focus of work by Anne Power [46], critiques by British architects Alison and Peter Smithson. Critique of open space by Jane Jacobs [22], Oscar Newman [41], discussion on negative effects of density on the social fabric of neighbourhood by Ellen Van Beekhoven, Gideon Bolt and Ronald van Kempen, Oscar Newman [41], Louis Wirth [189]. Recent criticism was made by Ali Madanipour [129] and Jan Gehl [14], [15]. Critique of large-scale housing estates in Tallinn by Leo Gens, who pointed out lack

of 'human scale' and thought that areas can become more people-friendly with introduction of small architecture forms, more clever organization of greenery, sculptures, etc. Psychologist Mati Heidmets assumed that the living environment in large-scale housing estates lacks personality, which can be achieved by prioritizing images and introduction of landmarks [40].

As **large-scale housing estates** comprise big part of the residential housing stock **in Riga**, there are studies focusing on the origins and development trajectories of large-scale housing estates: The Doctoral Thesis defended by Sandra Treija [254], *Otrā Rīga* represents the analysis of typology and features of large-scale housing estates in Riga [42]. The book *Latvijas arhitektūra: no senatnes līdz mūsdienām* by Jānis Krastiņš, Ivars Strautmanis, and Jānis Dripe compiles research on urban development in Latvia in the second part of the 20th century [26]. Planning and development of cities has been studied by Jānis Brinķis and Oļģerts Buka [5]. Doctoral Thesis by Una Īle [250] is focused on the landscape quality of courtyards of residential areas in the cities of Latvia. archive materials of Latvian museum of Architecture offer various territory plans of large-scale housing estates as well as descriptive materials. Andris Roze has analysed spatial organisation of *microrajoni* and proposed some guidelines for further development [261, 13–14].

Quality of urban life is a wide concept and has been investigated by various researchers in different fields. Robert W. Marans and Robert J. Stimson have summarized comprehensive research on the issues of urban quality of life and related notions like neighbourhood satisfaction, residential satisfaction, etc. [36]. Objective and subjective evaluation of the quality of urban life was presented by Roderick Peter McCrea in *Urban Quality of Life: Linking Objective Dimensions and Subjective Evaluations of the Urban Environment* [252]. Robert Marans and Willard L. Rodgers studied issues related to residents' satisfaction and described findings in *Towards an Understanding of Community Satisfaction* [131]. Angus Campbell used variable of inhabitants' characteristics (age, gender, etc.) to describe life satisfaction in *The Quality of American Life: Perceptions, Evaluations and Satisfaction* [6]. Harvey S. Perloff described and analysed urban environment features in *The Quality of the Urban Environment*, 1969 [45]. Charles Montgomery, through case studies

in different countries analysed inhabitants' satisfaction with life in relation to urban design and planning issues [39]. David Seamon and Jacob Sowers analysed people's need for associations with significant places and the concept of placelessness [168].

Following the growing interest in citizen engagement in the process of planning and co-creation, grows also the amount of research in this field. Approaches to **public participation** in planning and design processes have been described and analysed by Nick Gallent and Daniela Ciaffi [13], Patsy Healey [18], Ali Madanipour [34], Joanne Dolley and Caryl Bosman [10].

Despite the fact that variety of research was focused on privatization of open space in large-scale housing estates, on the character of open space in large-scale housing estates, as well as on residential environment quality and quality of urban life, research which would interconnect those issues so far is fragmented.

The research object is open space transformations in large-scale housing estates.

The research aim is to evaluate the impact of open space transformations in the post-socialist period in large-scale housing estates on the residential environment quality in Riga's large-scale housing estates.

Research Tasks

1. Based on literature studies summarise the background behind the formation of open space in large-scale housing estates in different cities of Europe, theoretical guidelines, aimed purpose of open space and the correspondence of the realised result, role of open space of large-scale housing estates in the city's green infrastructure and importance of the open space for residents.
2. Based on literature studies identify types of possible transformation processes in the open space of large-scale housing estates in different cities of Europe.
3. Identify opportunities and challenges for public participation in the process of large-scale housing estate open space transformations.

4. Summarise information on residential environment quality evaluation approaches and tools.
5. Develop an evaluation approach to assess the residential environment quality in the context of transformations.
6. Define residential environment quality of large-scale housing estates of Riga in the context of open space transformations by conducting the open space survey and using the adapted evaluation checklist.
7. Develop and conduct a survey in four large-scale housing estates of Riga, to define residents attitude towards transformations which have already happened and possible future transformations of open space in large-scale housing estates.

Research Methodology

The theoretical basis of research consists of the analysis of literature related to the development of open space of large-scale housing estates and features which influence the character of open space.

Based on the theoretical analysis of books, scientific articles, research reports, archive materials, internet resources and documents, the following methods are used to reach the research aim and objectives.

- Comparative analysis is used to:
 - analyse development of open space in large-scale housing estates and open space spatial configuration principles;
 - analyse scientific articles in *Science Direct* un *Scopus* data bases, using PRISMA methodology;
 - analyse residential environment quality evaluation tools [70], [81], [82], [188].
- Case study analysis – empirical research, that investigates a certain phenomenon in its natural environment, by using various data collection methods and sources [55], [62]. This research focuses on the case of open space in large-scale housing estates in Riga:
 - On-site observations and evaluation of residential environment using open space quality evaluation tool.
 - Inhabitants' surveys [102], [111], [149];

- For case description analysis of archive materials, regulations, scientific literature and internet sources is used.
- An experiment of introducing a community garden in open space of one selected large-scale housing estate. Urban gardening initiative realised in June 2017, with an aim to evaluate the process of getting a permission and the willingness of people to participate and maintain the garden. The method included concept development, preparation of requested documents, engagement of local inhabitants, organisation of the event together with project team and volunteers.
- The collection of quantitative data was insured by inhabitants' survey (240 respondents) with semi-open questions (to provide alternative answer opportunities in case the respondents are not satisfied with the proposed answers).

Scientific Novelty of Research

The Doctoral Thesis contributes to the research on open space transformations in Riga's large-scale housing estates in the post-socialist period, which has almost not been studied from the perspective of the relation between transformations and the quality of residential environment. The research has a methodological significance, as it summarises the data on existing residential environment evaluation tools, proposes classification of open spaces in large-scale housing estates, and introduces an approach for evaluation of impact from present and possible future transformations on the quality of residential environment in large-scale housing estates.

Practical Significance of the Work

This research examines an up-to-date issue of open space significance in large-scale housing estates and emphasizes the need to identify the impact of open space transformations on the residential environment quality. The research reveals the most important features related to transformations in open space.

The research reveals the connection between open space transformations and increase or decrease of the residential environment quality. The developed evaluation approach can be used to identify the impact from transformations which have already happened and the ones which may take place in the future. This allows to evaluate various scenarios and prevent decrease of the residential environment quality. Conclusions which reveal the impact of open space transformations on the residential environment quality in Riga's large-scale housing estates form a background for development of planning guidelines.

All figures, diagrams, and tables, which do not have a source, are made or developed by the author.

Approbation of the results

Results of the research have been presented at various international and local scientific conferences and published in international and local scientific journals.

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1. DEVELOPMENT OF OPEN SPACE IN LARGE-SCALE HOUSING ESTATES

Chapter 1 discusses the genesis of open space in large-scale housing estates in the regional context of the Baltics and Northern Europe. The idea of high widely spaced apartment blocks raised already in the 1930s [17], [197]. Originally, open space in large-scale housing estate followed the concept of a car-free inner zone and the idea of different functions reachable in the walking distance [38].

Despite local peculiarities across Europe, there have been certain similarities in the formation of open space of large-scale housing estates. Sub-section 1.1 presents an overview on open space spatial configuration principles, and the further sub-sections display variety of inhabitants' needs in relation to the residential open space and the role of green areas in large-scale housing estates. Development was highly influenced by context, construction period and scale, location and connectedness, maintenance, population structure, stigmatisation, local economy, public space, livability.

1.1. Genesis and Characteristics of Open Space in Large-Scale Housing Estates

Spatial organisation and the approach to the open space organisation differed in different parts of Europe. Literature studies have shown the following main types of spatial structures within large-scale housing estates: a surround-type where a square inner-courtyard is formed between apartment buildings, a semi-closed form (often U-shaped courtyards formed by building blocks or u-shaped buildings), a canyon-type formation with grand roads with apartment buildings along both sides or along one side and a parallel blades formation featuring long rows of parallel buildings [75], [133], [194], [253]. The analysed case studies allowed to find examples of these types as well as to define some additional types. Similar open space spatial organisation types across Europe make it possible to search for replicable solutions when considering raising the quality of residential environment.

1.2. Open Space in Large-Scale Housing Estates in Relation to Residents' Needs

Features of open space in large-scale housing estate, like the presence of open green space, children and adult recreation facilities, parking facilities, and their cleanliness and safety are among features which define residential satisfaction with the area [36, 267]. Research on large-scale housing estates from RESTATE project showed that green open space is considered among the most valuable features of the estate [49]. This sub-section describes the features of open space in large-scale housing estates in relation to the necessary, optional, and social activities and the importance of open space for residents' health, well-being, social interaction, and social cohesion.

The social space in large-scale housing estates is also important. Large-scale housing estates comprise diverse inhabitant groups who have different needs in terms of recreation and socialisation. Sometimes these needs appear to be in conflict. For this reason, in order to ensure that different inhabitant groups are satisfied, recreational amenities should be planned based on analysis of the whole large-scale housing estate to ensure fair distribution of different open space uses.

1.3. Role of Open Space of Large-Scale Housing Estates in the System of Green Infrastructure

One of the characteristic features of large-scale housing estates are large open green spaces. This feature was highly appreciated by inhabitants; however undefined use of this space fostered quick decay, and nowadays these green areas are not used effectively. However, if maintained and retrofitted in a right way, they can form a part of the cities' green infrastructure and thus contribute to the quality of urban life of local residents [209], [210], [225], [248]. It is important to have good quality green space near your place of residence. According to Urban Green Nation Report 2010, people visit and use green space more if it is of good quality and do not use less marginalized, decayed green areas [203].

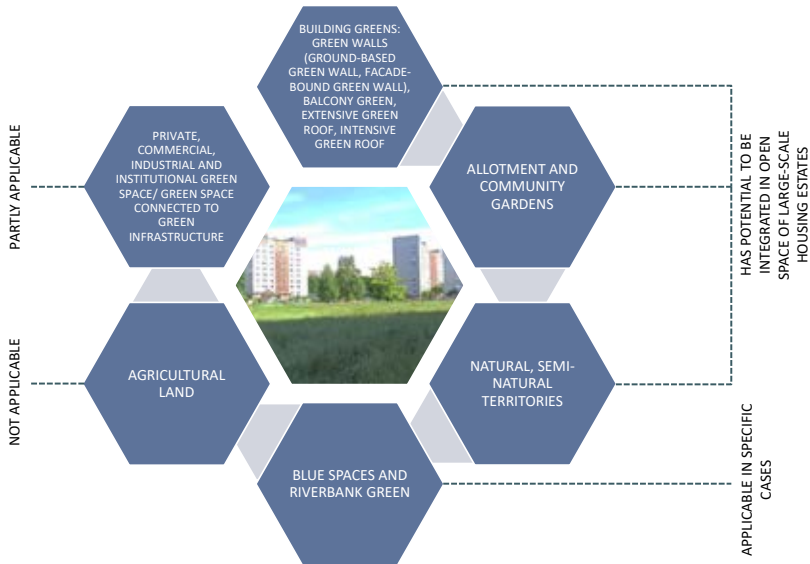


Fig. 1. Elements of urban green infrastructure and their potential to be integrated in open space of large-scale housing estates [adapted by author using [150]].

The question of the role of large-scale housing estate open spaces within GI is strongly connected to its ability to be a part of interconnected network. Elements of urban green infrastructure and their potential to be integrated in the open space of large-scale housing estates are shown in Fig 1.

Many of these types of urban green spaces, for example community gardens, neighbourhood green space, green roofs, and even blue spaces can be found in open spaces of large-scale housing estates, which shows that these areas might represent different types of UGI elements. In the last decade, growing importance are gaining circular approach to architecture and urban planning and a complex integration of nature-based solutions using the circularity principles. Integration of nature-based solutions allows support of various ecosystem services within the open space of large-scale housing estates.

2. INTERRELATION BETWEEN OPEN SPACE TRANSFORMATIONS AND THE RESIDENTIAL ENVIRONMENT QUALITY IN LARGE-SCALE HOUSING ESTATES

As a starting point of transformations in the open space of large-scale housing estates were changes in the result of changing political situation – regaining of the independence in Latvia [257]. This has led also to transformations in ownership, maintenance, management models, etc. **Chapter 2** presents the summary and analysis of transformation types in the regional context, summary of residential environment quality notions and quality assessment approaches, and the interrelation of these two aspects – assessment of transformations’ impact on the residential environment quality.

2.1. Open Space Transformations Within Large-Scale Housing Estates of Europe

The land reform and property denationalisation in the 1990s [257] has led to the current difficult situation, where the open space in large-scale housing estate is fragmented, owners are different, often the land being in property of private and even foreign people who are not interested in development of recreational open spaces. Later, more and more transformation drivers appeared. In general, currently the transformations are influenced by economic factors (related to strategies – e.g. compact development; actors – developers, land owners, who see good infrastructure of large-scale housing estates as an opportunity for new investments, profit); by ecological and social factors (changes in habits, care about ecology, nature-friendly lifestyles, etc., strategies, legislation – green development, circular city); changes in residents’ needs, demographic changes, new partnerships (public-private, public-people-private) [218], [224], [226]; natural changes in the public open space influenced by natural time related changes (like overgrown trees, ageing recreational and functional amenities, etc.).

These transformations are affected and affecting the three dimensions defined in the introduction: context I – physical environment of the public open space in large-scale housing estates; context II – legal issues (regulations, ownership, management structure, etc.), city development strategies, etc.; actors – involved in transformation processes and management of public open space of large-scale housing estates (their roles and collaboration patterns).

Citizens can play a crucial role in identifying or actively intervening in urban challenges, often providing new perspectives and solutions [13], [18], [34]. To test opportunities and barriers for citizen-led bottom-up transformation in Riga, in terms of this research the experiment was conducted. The main aim was to promote more active use of open space and to show local inhabitants the concept of community garden by providing a real example. The guerrilla action proved the hypothesis of community garden being a good tool for social cohesion. However, it has been found that the approval process needs to be made easier and clearer.

The role of partnership and citizen empowerment in urban politics has increased in the course of the last decades [72]. Also, in Riga several participatory budgeting programs are realised (Fig. 2).

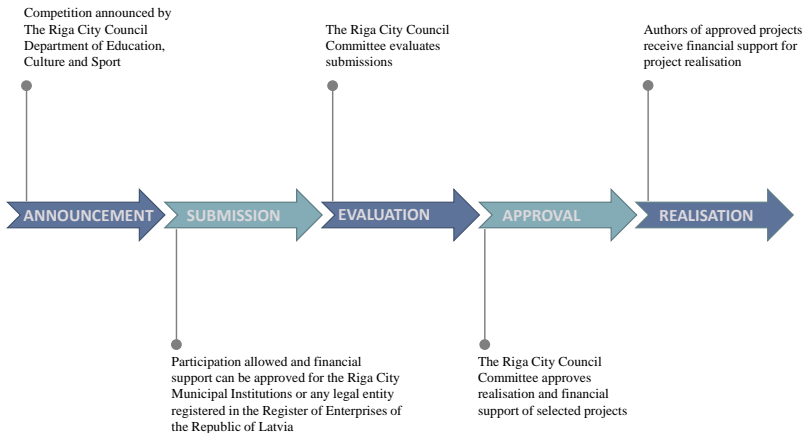


Fig. 2. The process of community project budgeting in “Neighbourhood’s initiative to promote public participation and strengthen the sense of community”.

Analysis of geographical distribution of formal participatory budgeting activities showed certain injustice. It is clear that some neighbourhood associations, like those in *Čiekurkalns*, *Sarkandaugava* or *Maskavas forštate* are more active and successful, therefore the strengthening of community and identity as well as urban regeneration activities happen more often and processes are faster and with wider public participation. Whereas other neighbourhoods have only one or no projects realised in the course of four years (2016–2019).

2.2. The Concept of Residential Environment Quality and Its Evaluation Methods

When considering the quality of open space in large-scale housing estates, it is important to understand the variety of concepts. The review of various concepts aims to identify the most suitable notion in terms of this study [66], [67], [68], [74], [80], [82], [252]. Identification of the most suitable concept allows to collect, analyse, and compare currently available evaluation tools. Evaluation of transformations in public open space must include on-site observations, as it helps to overcome certain shortcomings presented by administrative data: bottom-up activities, level of maintenance, presence of disorder. Combination and comparison of objective (e.g. on-site observation) and subjective (survey) evaluation tools is desirable, as these approaches complement each other. Finally, the concept of proximity needs to be included, as each public open space in the large-scale housing estate can't answer all the diversity of needs of different inhabitant groups. Thus, those transformations which already happened or are planned to improve the residential environment quality need to be evaluated using proximity to home approach.

2.3. Evaluation of Impact of Open Space Transformations on Residential Environment Quality

A systematic review of the review and research articles in Science Direct and Scopus databases was undertaken using the PRISMA methodology. After systematic review of 1183 articles, 22 built environment assessment tools were identified for further deeper analysis.

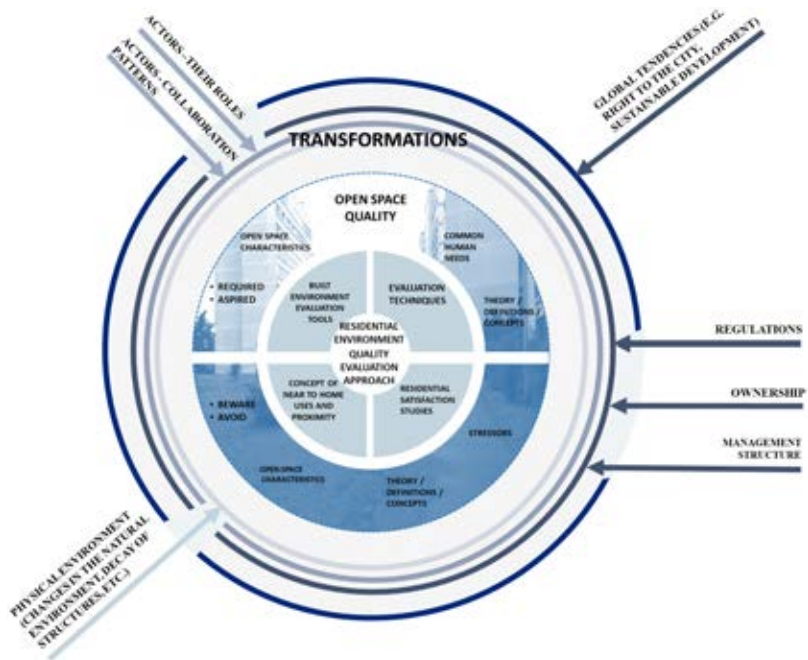


Fig. 3. Development of the residential environment quality evaluation approach – a conceptual model.

To justify positive and negative factors, while analysing interrelation between the selected indicators from Built environment assessment tools and the features identified by Matthew Carmona [195], additional theoretical background was incorporated. The common human needs, as defined by John Zeisel, and the stressors, as illustrated by Michael Pacione [43], were included into the final model.

The adapted checklist is a part of the residential environment quality evaluation approach. Evaluation techniques include on-site observations, analysis of digitally available data, mapping and analysis with incorporation of GIS, residential satisfaction studies using surveys, questionnaires and interviews. Finally, the concept of near home functions and functions reachable in ten-minute walking

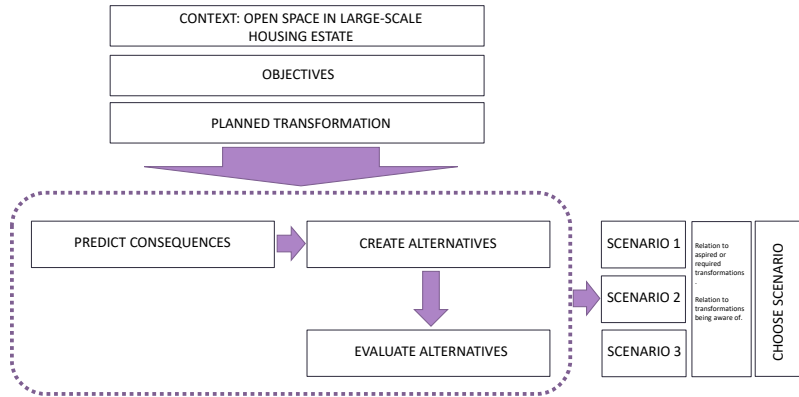


Fig. 4. The model of using the evaluation tool for assessment of future transformations and their impact on the residential environment quality.

distance from the basis for the proximity and accessibility analysis. The conceptual model of the impact of open space transformations on residential environment quality is presented in Fig. 3.

The evaluation approach can be used not only for the evaluation of present state, but also for evaluation of future transformations and alternative scenarios (Fig. 4). When there is an objective for specific transformation, its consequences can be analysed using the approach. The same approach can be used when considering alternative scenarios and the consequences of those alternatives.

For example, the infill development can have both positive or negative impact on the residential environment quality. If correlated with stressors defined by M. Pacione [43], gated communities create barriers, which work as stressors. It is also of importance what kind of open public space is created after the open space is reshaped by introduction of a new development. Also, the contrast between building qualities appeared in the built environment assessment tools as a negative feature. On the other hand, infill development which offers opportunities for more and diverse recreational, social space for both residents within and outside the new project, increase the quality.

3. RESIDENTIAL ENVIRONMENT QUALITY IN LARGE-SCALE HOUSING ESTATES OF RIGA IN THE CONTEXT OF OPEN SPACE TRANSFORMATIONS

Variety of transformations which take place in the open space of large-scale housing estates have different impact on residential environment quality. The impact can be evaluated according to human needs in open space, still certain modifications may have different influence when present in different circumstances. **Chapter 3** presents the situation in Riga: open space character, transformations and their impact on the residential environment quality as well as residents' attitude towards possible future transformations and those which have already happened.

3.1. Characteristics of Open Space in Large-Scale Housing Estates

Following the analysis of various spatial configurations of open space in large-scale housing estates, detailed plans of large-scale housing estates in Riga were investigated. Following this, the approach to classify open space is chosen according to its physical structure or the pattern. Here the idea of positive and negative spaces proposed by Christopher Alexander was chosen [1]. Additionally, theoretical background of research includes studies conducted by Camillo Sitte, findings available from Jan Gehl's research, and the key principles of public open space design defined by Nikos Salingaros and Pietro Pagliardini [1], [14], [15], [52], [162]. Large-scale housing estates in Riga represent various types of spatial configuration.

3.2. Open Space Quality Transformations in Large-Scale Housing Estates

The developed residential environment evaluation approach to measure existing situation and the impact of transformations on the quality of the open space has been tested in large-scale housing

estates in Riga. Assessment was conducted in the following large-scale housing estates: *Āgenskalna priedes, Sarkandaugava, Jugla, Ķengarags, Imanta, Purvciems, Bolderāja, Iļģuciems, Vecmīlgrāvis, Mežciems, Pļavnieki, Zolitūde, and Ziepniekkalns* [42]. Although Riga's large-scale housing estates show variety of problems, like unsatisfactory level of environmental accessibility, lack of and monotonous recreation opportunities, lack of privacy, current transformations solve only part of these problems. Thus, an analysis of current situation and inhabitants' needs is crucial before introducing transformations.

3.3. Correlation Between Residential Opinion and Open Space Transformations

Residential satisfaction surveys allow to complete objective evaluation data with subjective residents' assessment. There are two main approaches in the satisfaction studies: general satisfaction and assessment of satisfaction with various aspects of the residential environment [92], [128]. Based on the literature review about large-scale housing estate residential satisfaction studies and survey methods, online residents' survey has been carried out. The target respondents were residents of large-scale housing estates in Riga (from *Jugla, Imanta, Purvciems, Ziepniekkalns*). These neighbourhoods were selected as the ones representing different construction periods and different scales.

Questionnaires were developed in two languages: Latvian and Russian, to ensure respondents chose the most convenient way and understand all the questions. The Likert-type scale was used to measure respondents' satisfaction with various components of the open space and to rate the attitude towards present and possible transformations. The sample size was calculated taking the confidence level set up to 85 % and the margin error to 10 %.

The Questionnaire was completed by 240 respondents. Majority of respondents live in large-scale housing estate more than 5 years, with about 70 % living in estate more than 10 years. Majority of respondents are owners of the flat where they live. More than 60 % of respondents of all estates where the survey was conducted have higher education.

The results are divided into three main sections: current state and use of open space in large-scale housing estates; attitude towards transformations which have already happened; attitude towards possible transformations, wishes and needs.

Among the main reasons for not using the open space in large-scale housing estate people mention being unsatisfied with spatial organisation, the amount and variety of recreational choices, maintenance, as well as the reason that they “are spending free time in other nature territories (parks, forests, lake side, etc.)”. The most desired additional features related to recreational amenities, like benches and playgrounds that already exist, would be flower beds, meadow flowers, grill place, sheltered space as protection from environmental conditions, pergolas with growing plants, and also landscaping.

The data in general survey supports the previously gained data about the importance of greenery in large-scale housing estates. Regeneration visions which aim at inclusion of large-scale housing estates in the green infrastructure by creating diverse interconnected nature-based solutions is the way how future of estates could meet social and ecological needs. Positive influence of greenery was proved with variety of answers pointing out the wish for new greenery, garden beds, meadow flowers, etc. Also, in the case of infill residential environment, presence of new greenery was pointed out as a feature which would compensate the negative effect from open space area decrease.

CONCLUSIONS

1. **Spatial organisation** of open space in large-scale housing estates **is similar** in the Baltics and Northern Europe. Therefore, replicable solutions can be adapted for raising the quality of residential environment. In addition to similarities in spatial allocation of buildings and open space scale, successful adaptation of solutions requires similarities in building scale, quantity and quality of greenery, soil characteristics and other factors.
2. Residents of large-scale housing estates represent **diverse groups with diverse needs** and wishes in terms of recreation and socialisation. Sometimes these needs appear to be in conflict. Planning of recreational amenities on the large-scale housing estate level guarantees interconnection and accessibility of services. This ensures that different inhabitant groups are satisfied with the residential environment quality.
3. **Vast green spaces** appear a distinctive feature of large-scale housing estates, thus, also in the third decade of the 21st century, estates have potential to form a part of city's **green infrastructure**. Examples of other European cities show the ability to develop rich multifunctional green environment which provides a variety of ecosystem services. Some solutions, like introduction of sustainable urban drainage system, are realised with big investments in perspective of five years or even longer time. Still, others, like community gardening initiatives, appear as fast and / or temporary solutions, where the time of approval varies depending on various factors, such as land ownership, complexity of design, and support of the local community.
4. Transformations which take place in open space of large-scale housing estates **vary in type, scale and are generated by variety of driving forces**. While these driving forces have different objectives, their collaboration results can lead to high-quality transformations, which answer the needs of all involved actors.

5. Guidelines and the **good practice guidebooks** are used in many cities across Europe to support both experts and other involved actors in their decision-making and to avoid common problems. Guidebooks address a wide variety of issues, like recommendations on technical solutions or approaches and steps of public involvement in co-design and co-creation processes. Sharing knowledge is crucial when ensuring the same mistakes are not made.
6. Various residential environment quality evaluation tools exist, and such tools **comprise diverse criteria** for quality evaluation. However, these tools do not address the impact of transformations on the residential environment quality in open space of large-scale housing estates. Inclusion of on-site observations and more specific criteria is among crucial aspects in the evaluation of the impact from transformations.
7. Residential environment quality evaluation approach, which has been developed within the framework of this research, comprises an adapted open space quality evaluation checklist, recommendations on proximity of different functions to home, summary of evaluation techniques and residential satisfaction studies related to open space quality and transformations. Residential environment quality evaluation approach can be used for both evaluation of **the impact from transformations**, which have already happened, and analysis of **possible consequences of future transformations** and search for alternative scenarios. Categories which describe different human needs and stressors are linked to the aspired results and results to be aware of. Improvements in the open space of large-scale housing estates need to be planned as a complex process, analysing the estate situation as a whole.
8. Spatial configuration and building height have certain impact on open space use. 'Undefined space' formed by nine-storey or higher tower blocks, appeared among the most unsuccessful solutions. In their turn, the analysed 'positive space' and 'undefined space' formed by structure combinations of five-storey building blocks, appeared to support social activities. Thus, **pattern analysis is essential**

- before new transformation is introduced**, so that even if the open space gets smaller, the quality increases.
9. Development and improvement of the territory adjusted to the house and being in collective ownership of residents is largely dependent on the **wishes and active engagement of those residents**. Currently visible results of this collective decision-making in relation to open space transformations are seen in relation to car parking. Any other initiatives such as recreational amenities and new natural elements appear mainly as bottom-up guerrilla initiatives, thus the quality and safety cannot be regulated.
 10. Although Riga's large-scale housing estates feature a variety of problems, such as unsatisfactory level of environmental accessibility, lack of and monotonous recreation opportunities, lack of privacy, the current transformations can solve only part of the identified problems. Thus, an analysis of current situation and inhabitants' needs is crucial before introducing any transformations.
 11. New **residential infill development having more than five-stor**eys has a negative impact on the quality of open space in large-scale housing estates by destroying the human scale. Thus, restrictions on the building height are crucial also in cases where existing buildings are more than five storeys tall and new construction is allowed to be higher.
 12. **Land ownership often becomes a barrier for more balanced transformations** – in case of improvements in the open space of large-scale housing estates. New public-private partnership models are a precondition of successful involvement of all parties and a guarantee of their motivation.

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