FUNCTIONALITY OF STREETSCAPE.
EXAMPLE OF PURVCIEMS NEIGHBOURHOOD

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**Abstract. Streets form the city's living environment and play an important role in social interaction, they are the most accessible public outdoor spaces in the city. Many cities still prioritize vehicular traffic and it is necessary to improve streetscapes to make them more liveable, suitable, and inviting for pedestrians and cyclists. The paper presents research on streetscape analyses and development and highlights the streetscape as an essential part of the human living environment. Purvciems neighborhood in Riga is chosen as a pilot territory. Contemporary street planning approaches and tools are compared. Riga's development planning documents are evaluated by assessing the development opportunities of the Purvciems neighborhood. The existing spatial structure and the ecological, economic, and social aspects of the street landscape of Purvciems are examined in detail. A development vision has been created to improve the functionality of the street landscape spaces in Purvciems at various scales, along with adaptable modular solutions. The developed recommendations and principles, adapted to specific locations, can be used for planning street landscapes in other neighborhoods of Riga and similar-scale territory planning.
Keywords: streetscape, street design, ecological, economic, social planning aspects**

Introduction

Historically, villages and cities were located along roads. Streets traditionally served three main functions: providing mobility, commercial activity, and social interaction. However, the multifunctionality of streets is often overlooked, and streets are considered as simple links of the road network, facilitating movement between two or more destinations. Modern street planning derives from ancient practices and road construction technologies. The earliest street law dated ~ 100 BC. [21]. With the advent of automobiles in the 20th century, the streets underwent significant transformations. Many cities prioritized vehicular traffic by diverting pedestrian traffic onto narrow sidewalks. Cities became distinctly car-centric, losing focus on people-oriented urban design [2]. Based on the experience gained from the car-centric cities of the 20th century, urban planners in the 21st century have concluded that multimodal transport networks ensure sustainable growth, equal economic opportunities, and high quality of life. Modern urban residents need transit-oriented neighborhoods with accessible sustainable modes of transportation—walking, cycling, or using convenient public transit. By 2050, 75% of the world's population is expected to live in cities, making it increasingly necessary to balance personal mobility and economic accessibility in urban streets [3].

The character of the street is formed by the overall streetscape scene, which includes the sidewalk, roadway, street furniture, amenities, buildings adjacent to the street, street lighting, greenery, and street trees. Streets provide the main mobility in the city and organize the space. Nowadays, various street planning approaches are being actualized such as complete street, healthy street, and shared space street planning approaches [3, 4]. However, the common denominator of these planning approaches is to emphasize the importance of humans in the urban environment, create an inclusive environment, actualize the use of alternative transportation, and improve well-being and overall quality of life [12].

Streets form the city's living environment and play an important role in social interaction, they are the most accessible public outdoor spaces in the city and the most important city organs [8]. Streets ensure the functioning of the traffic infrastructure and the transmission and performance of overground and underground civil engineering services. Streets play an integral role in people's daily lives, making it possible to move from point A to point B, however, functional and human-oriented streetscapes not only serve as transportation corridors, but they can also serve for leisure. Streets can provide different urban activities such as various social, economic, and political activities [11].

Using street greenery, it is possible to encourage biological diversity, improve environmental quality and microclimate, and reduce noise and environmental pollution, thereby streetscapes can provide important urban ecological functions. By planning street greenery, it is possible to design the streets as green corridors that connect various urban nature territories. Greenery can serve as a tool that improves the city's aesthetics and creates its character. By functionally planning greenery, it is possible to use it as a safety-enhancing element [3].

The street planning approaches and tools discussed in the study are oriented towards ensuring sustainable urban growth with the necessary infrastructure for pedestrians, cyclists, public, and private transport. These approaches and tools aim to create an inclusive environment that ensures safety, comfort, and opportunities for social interaction. Ecological, economic, and social aspects can be achieved in the street by utilizing various street planning approaches and tools.

The street landscape of the Purvciems neighborhood in Riga, the capital of Latvia, was chosen as the research area. There are 58 neighborhoods in the city of Riga. The streets of the Purvciems neighborhood do not fully provide ecological, economic, and social aspects, they primarily serve as transportation corridors. The streets are not adapted for various groups of users, and there is no viable, human-oriented public outdoor space that would encourage residents to stay and socialize in the streetscapes. In the survey conducted in 2013 about life in the Purvciems neighborhood, the condition of roads and sidewalks was evaluated most negatively [6].

The study highlights the streetscape as an essential part of the human living environment and the need to direct actions in the Purvciems neighborhood to improve the functionality of the streetscape and the quality of the living environment. Thereby the study aimed to develop a proposal for improving the functionality of the streetscape in the Purvciems neighborhood, which could also provide ecological, economic, and social aspects. The methods and approach used can serve as an example in the evaluation and development planning of similar areas. To achieve the set goal, the historical development of street landscapes,
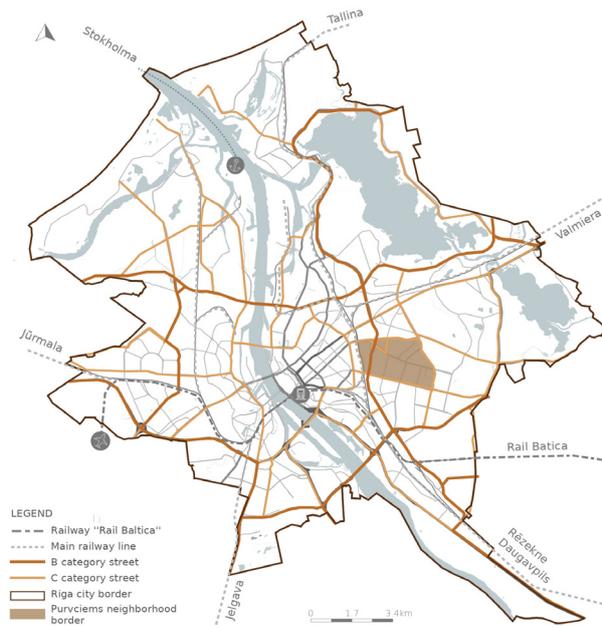
Fig. 1. The planned development of Riga's transport infrastructure [conducted by author]

various street planning approaches, and tools in Latvia and the world were studied. The development directions of the Purvciems neighborhood were evaluated in the context of the development planning documents of Riga city, and a study of the current situation of street landscape in the Purvciems neighborhood was carried out. A proposal was developed for improving the functionality of the streetscape in the Purvciems neighborhood at various scales.

Materials and Methods

The study investigated the historical development of street landscapes and an evaluation of street planning approaches and tools used worldwide. The research was carried out from April 2023 to December 2023. Best practice examples were assessed, and an evaluation of the Purvciems neighborhood was conducted within the context of Riga city's development planning documents [1, 14, 15, 16, 18, 19, 20, 22] (Figure 1). As part of the study, an assessment of the current state of street landscapes in the Purvciems neighborhood was conducted in September 2023. The spatial structure of the Purvciems neighborhood was evaluated based on K. Lynch's theory of the five elements that contribute to the legibility and clarity of urban spatial structures, which allowed for the identification of paths, edges, districts, nodes, and landmarks in the Purvciems neighborhood [9].

In evaluating the functionality of street landscapes, assessment criteria were selected, and a matrix was created based on the street planning approaches and tools analyzed in the study. Street landscapes can provide vitally important functions, categorized into three groups: ecological, economic, and social aspects. These are the three main aspects included in the matrix to analyze the functionality of street landscapes in the Purvciems neighborhood.

The ecological aspect is divided into two subcategories: green infrastructure and sustainability. For green infrastructure, the quality of green infrastructure in Purvciems, the aesthetic quality of plantings, and the connectivity of green infrastructure were analyzed. For sustainability, stormwater solutions, the use of sustainable materials and elements, and waste management were assessed.

The economic aspect is divided into subcategories: land

use functions and mobility. Land use functions include the functions of ground-floor properties, and the placement of commercial and improvement elements in the street space. Mobility includes the accessibility of the street space for various user groups and the availability of public transport and cycling infrastructure.

The social aspect is divided into subcategories: visual and emotional accessibility. Visual accessibility includes the quality, scale, and harmony of the street condition, and environmental accessibility. Emotional accessibility includes the sense of security, the ability to navigate, and noise intensity in the street space. Each subcategory of the main aspects was evaluated on a 3-point scale, with 3 points being the highest rated indicator, 2 points being a satisfactory indicator, and 1 point being a low-rated indicator.

In evaluating the current and planned situation, streets that ensure the most important neighborhood connectivity were surveyed in the field. In 2023, the main connectivity and access of streets in the Purvciems neighborhood were provided by streets of categories C, D, and E. In Latvia, a B-category street (transit street) is the beginning, continuation, or end of a main or regional state road with a dominant connecting function and a subordinate access function. A C-category street is a major street that provides both connecting and access functions. A D-category street is a city street that provides access to individual land plots and can also perform a connecting function during certain hours of the day. An E-category street is a local street that primarily provides a residential function while also performing an access function [23]. Based on the Riga territorial plan, it was concluded that a B-category street is also planned in the western part of the neighborhood, which would perform a dominant connecting or city arterial function [19]. At the time of the survey, the street was under construction, and the planned B-category street was not surveyed.

In conclusion, recommendations were prepared for street landscape solutions in the Purvciems neighborhood at various scales, and spatial modeling of the planned solutions was carried out.

Results

Evaluating the development planning directions for the Purvciems neighborhood in the context of Riga city revealed that Riga's development vision focuses on integrating alternative modes of transportation into the urban environment, ensuring mobility, and developing diverse public outdoor spaces, including improving the functionality of street landscapes. Although the documents are subordinate to each other, inconsistencies are observed in some places. It should be noted that not all development visions outlined in planning documents are brought from concept to implementation.

In some local-scale projects, the guidelines and vision for sustainable urban development established at the city level are not always taken into account. Current projects in the Purvciems neighborhood show both positive features, such as tendencies towards sustainable urban development, including new and connecting cycling infrastructure and improvements to the public transport network. However, there are also negative aspects where the projects do not comply with the city's guidelines on integrating green mobility and ensuring comprehensive environmental accessibility.

The evaluation of the spatial structure of the Purvciems neighborhood shows that the main structure consists of multi-story buildings with at least four or more floors, with residential areas occupying nearly 50% of the neighborhood's total area. Purvciems is the most densely

populated neighborhood in Riga. It borders six other Riga neighborhoods, but its internal spatial structure is composed of several more fragmented district zones, including areas with multi-story and low-rise buildings, mixed-use areas, and industrial zones, defined by building type and height [17]. Considering the total number of residents in Purvciems and the population density of the adjacent neighborhoods, these areas together account for more than 25% of Riga's total population. Therefore, it is particularly important to ensure an efficient and unified transport infrastructure network that can serve a significant population density in this part of Riga [7]. However, since 2000, the population in Purvciems has decreased by approximately 10,000, while in Riga overall, it has decreased by around 150,000. The overall population statistics of Latvia have shown a significant decline since the 1990s. To increase the desire for people to live in the city, it is important to provide public outdoor spaces that meet people's needs and modern quality standards, with accessible green infrastructure, economic viability, and socialization opportunities [7]. The study emphasized the inclusion of all population groups. One-third of Purvciems residents are children and seniors, highlighting the need to ensure environmental accessibility, comfort, and safety. Meanwhile, two-thirds of the neighborhood's residents are of working age, underscoring the need for accessible workplaces, socializing, and recreational areas near their homes [5]. The most significant nodes in the neighborhood form around its major landmarks. The widest street edges are found along the neighborhood's C and D category streets. The available natural areas within the neighborhood's internal structure are fragmented and unclear, with the most prominent green infrastructure, requiring improved access and connectivity, located on the neighborhood's periphery. Natural and landscaped areas in Purvciems occupy only 3.4 hectares of its total area. These natural areas do not include street and courtyard plantings, which supplement the neighborhood's green infrastructure. However, it should be noted that these planting structures do not form extensive, unified areas. Regarding Purvciems' blue infrastructure, there are no observable water areas in the neighborhood [13].

Regarding the assessment of ecological, economic, and social aspects in the Purvciems neighborhood, economic aspects received the lowest rating, reflecting issues with land use functions and mobility. The accessibility of streets for various user groups and the lack of amenities were evaluated negatively. Social and ecological aspects were rated slightly more positively. By analyzing the obtained data in more detail, it was possible to evaluate the main shortcomings and positive values of each street category.

For C-category streets, environmental and ecological aspects were rated the highest. The connectivity of green infrastructure was positively evaluated. However, there is a need to improve environmental accessibility and safety in street sections where these aspects are at the lowest level or where unauthorized street crossing is frequently observed. Orientation ability was rated the highest, with some of the neighborhood's most significant landmarks located along C-category streets.

In D-category streets, the provision of environmental and ecological aspects is comparable to that of C-category streets. The connectivity of green infrastructure was rated the highest, with a two-level planting structure dominated by regularly mowed grass strips along sidewalks and various tree species, although high biodiversity was not observed. The economic aspects were rated the lowest for D-category streets. The street space is mainly intended for pedestrians and motorized vehicles. There is a lack of amenities, and street-level commerce is not observed. On the other hand, public transport accessibility and the use of ground-floor properties for commercial activities and services were evaluated more positively. Social aspects were also rated more positively. The quality of the street condition in D-category streets is better than in C-category streets.

The provision of economic aspects in E-category streets was rated the lowest. The use of ground-floor spaces is primarily for private use, namely residential, and commercial activities are not observed. The evaluation of environmental and ecological aspects ranks second. There is a mix of publicly accessible and residential green infrastructure, forming a unified network. This street category also features a two-level planting structure with mowed lawns and various tree species. Social aspects were rated the highest for E-category streets. These streets have lower noise levels due to less traffic intensity. The streets are narrower, making them more suitable and pleasant for human scale.

It can be concluded that improvements are needed in ecological, economic, and social aspects across all street categories in the Purvciems neighborhood. The main emphasis is on promoting mobility and service accessibility, introducing amenities, improving the quality of green infrastructure, and developing a sustainable urban environment.

Conclusions and Recommendations

In the potential development vision of Purvciems, it is possible to foresee the improvement of a multimodal street network and street functionality. By establishing a multimodal street network and developing mobility hubs, both the mobility of the Purvciems neighborhood and adjacent area residents could be enhanced, thus promoting sustainable urban development. It is crucial to introduce a holistic development approach to enhancing street functionality, considering the interconnectedness between the neighborhood and city-scale context.

Firstly, it is necessary to develop a sustainable transportation plan that ensures comprehensive and integrated cycling infrastructure and an efficient public transportation system to improve mobility, and accessibility, and reduce traffic congestion.

Secondly, integrating environmentally friendly initiatives such as landscaping and tree planting is important. It is essential to create a functional landscaping structure in the neighborhood to enhance biodiversity and improve the aesthetic and environmental quality. In planning greenery for C and D category streets, sustainable rainwater drainage solutions can be integrated by designing rain gardens and bio-swales to infiltrate stormwater runoff collected from hard surfaces, driveways, and sidewalks.

Thirdly, to promote social interaction and economic growth, the development of a neighborhood center is necessary. By organizing and developing areas adjacent to streets and roads, it is possible to create economically and socially active neighborhood centers. Squares or plazas could be integrated into the central part of the neighborhood to encourage community gatherings and socialization. Planned mobility hubs are intended to be located at significant landmarks, active transportation nodes, and major intersections within the neighborhood. Accessible public transportation with well-equipped public transport stops, electronic boards displaying real-time transportation arrivals, and accessible ticket vending machines should be provided at hub points. Multi-story or underground parking lots, bicycle parking facilities, and spaces for bicycle and electric scooter rentals

Fig. 2. The planned development of Purvciema neighbourhood [conducted by author]

LEGEND

- Railway
- Planned B category street
- Planned C category street
- Planned D category street
- Planned bicycle priority street
- The planned pedestrian and bicycle street
- 1st priority bicycle infrastructure
- 2st priority bicycle infrastructure
- 3st priority bicycle infrastructure
- Planned tram infrastructure
- Expansion of the public transport network
- (P) Planned multi-storey parking lot
- (P) Mobility point parking lot

- Planned mobility point
- Neighborhood center
- Neighborhood economically and socially active area
- Buffer planting zone
- Green Infrastructure Corridor
- Green area
- Planned recreation area
- Planned connection of green areas

① T/C "Minska"
② Purvciema tirgus
③ LIDO Ķirsons māja
④ A/S "Mēbeļu Nams"
⑤ Rīgas Sv. Trīsv. Romas katoļu baznīca
⑥ Deglava Tirdzniecības centrs
⑦ Pļavnieku tirgus
⑧ Biķernieku memoriāls
⑨ T/C "Domina"

- Planned public transport stops
- Existing public transport stops

should be provided at mobility hubs. Street-level commerce can be integrated at mobility hubs by setting up market stalls, kiosks, or mobile vending.

In all categories of streets in the Purvciems neighborhood, it is possible to fully address ecological, economic, and social aspects, fostering neighborhood growth towards a sustainable and people-oriented living environment. By improving the aforementioned aspects, the negative impact on the environment would be reduced, economic growth would be promoted, social interaction would be facilitated, and potentially, an increase in the neighborhood's population could be achieved. Quality public spaces would be available to existing social groups in the neighborhood, which would be more favorable for mental and physical health.

Main planning principles for C category streets:

- Introduce multi-level planting structures in green corridors.
- Include vertical plantings along building facades in areas adjacent to the street.
- Design functional planting zones that also serve to slow down and infiltrate rainwater runoff, improve safety, and delineate zones.

- Use mulch in plantings.
- Integrate energy-efficient lighting with smart management systems, provide waste sorting, use sustainable elements and materials.
- Plan a multimodal street network with accessible mobility points, cycling infrastructure, and public transport.
- Activate ground-level commercial activities and street vending.
- Install permanent landscaping elements, environmental and art objects, and seasonally adaptable solutions.
- Ensure environmental accessibility, quality road surfaces, and safety.
- Limit the speed to 40 km/h in the neighborhood center and economically active zones.

Main planning principles for D category streets:

- Promote the improvement and accessibility of green infrastructure quality.
- Provide green infrastructure that separates street functional zones.
- Adapt rain gardens and/or bio-swales.
- Use sustainable elements, materials, provide energy-efficient lighting, waste sorting bins.

- Locally available commercial services at ground level.
- Accessible seasonal dining terraces for establishments adjacent to the street.
- Unified pedestrian and bicycle network accessibility.
- Separately located street vending points.
- Accessible landscaping elements and public transport stops with available shelters.
- Ensure environmental accessibility and a quality road condition.

Main planning principles for E category streets:

- Provide green infrastructure connectivity with point-like tree plantings.
- Establish planting zones enhancing aesthetic quality near significant objects.
- Include seasonal plantings.
- Incorporate bio-swales in wider grass strips.
- Implement shared street use principles, prioritizing pedestrians and cyclists.
- Additional cycling infrastructure elements available, with bike racks near educational institutions.
- Provide accessible amenities in the street space promoting public space usage.
- Adapt seasonal, modular solutions in parking areas.
- Utilize speed-calming elements such as raised intersections, speed bumps, and road narrowing.
- Reduce speed limit to 30 km/h.
- Ensure a quality pavement surface and pedestrian network connectivity.
- Use environmental and art objects as landmarks, creative environmental solutions are also provided near educational institutions, serving as speed dampeners.

The use of modular solutions in streetscape involves movable or adaptable structures for various purposes. Modular solutions can be adapted in all street categories of the Purvciems neighborhood. By developing guidelines and standardized, adaptable prototypes, it is possible to create a unified visual identity for the neighborhood. With modular solutions, it is also possible to offer new recreational opportunities, enhance green infrastructure, and improve safety. The developed recommendations and principles, adapted to specific locations, can be used for planning street landscapes in other neighborhoods of Riga and similar-scale territory planning.

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Kopsavilkums

Pētījumā veikta ielu ainavtelpu vēsturiskās veidošanās izpēte un pasaulē izmantotu ielu plānošanas pieeju un rīku izvērtējums. Apskatītās ielu plānošanas pieejas un rīki, kas orientēti, lai nodrošinātu pilsētas ilgtspējīgu izaugsmi un gājējiem, velobraucējiem, sabiedriskajam un privātajam transportam nepieciešamo infrastruktūru, paredzot iekļaujošu vidi, drošību, komfortu un iespēju socializēties. Izvērtēti Rīgas attīstības plānošanas dokumenti, veicot Purvciema apkaimes attīstības iespēju novērtējumu. Detalizēti izpētīta Purvciema apkaimes esošā telpiskās uzbūves struktūra un ielu ainavtelpu ekoloģiskie, ekonomiskie un sociālie aspekti. Izstrādāta Purvciema apkaimes ielu ainavtelpu funkcionalitāti uzlabojoša attīstības vīzija dažādos mērogos un pielāgojami modulāri risinājumi un sniegti ieteikumi galvenajiem plānošanas principiem C, D un E kategoriju ielās. Pētījums notika no 2023. gada aprīļa līdz 2023. gada decembrim.