The Study of the Landscape of Populated areas for needs of the Development of the Concept of Greenery

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Abstract. Thematic planning of the blue-green infrastructure is increasingly incorporated in development plans of European cities, within which the qualitative green structure is implemented at various scales – of the county, of the populated areas and locally. European experience shows that it is important to divide several levels or scales of planning (national, regional, county, city, local level) in the planning of green structures, defining the objectives and tasks to be achieved in each level, and the hierarchy between them. The methodology for developing the concept of the greenery is based on the planning of a three-level / scale greening system, based on widely used in Europe approaches for the development of green infrastructure, green network (green grid, etc.), basic principles of ecological design and urban acupuncture (the activation of urban space with punctuated public outdoor objects, elements, territories). The aim of the paper is to present the linkage between the theory and practice in the development of the concept of greenery for small scale populated areas. It is written that the structure and elements of the landscape of the populated area of Ikšķile (Latvia) and its villages have been studied and analysed as the pilot area. The levels included in the landscape study, as well as in the concept of the greenery of Ikšķile municipality – city, neighbourhood or village, landscape units and object levels – form a hierarchical system in which each subsequent level details the previous one. Similarly, the study of the existing greenery structure of the populated areas is based on a multi-level study which is linked to a future planning. The most significant natural and cultural historical elements of the city have been identified and analysed at the town level of Ikšķile, dwelling on the cultural historical structure of the populated area, as well as the day-to-day important objects and areas designated as "nodal points" in the town. The "nodal points" and the "linking elements" at the town level are analysed in two directions – objects and territories of daily importance and important for the development of tourism. At the level of neighbourhoods and municipality villages, the elements forming the identity of the place and the existing structure of greenery are more analysed. At the level of landscape units and objects, the existing greenery elements in specific functional zones and situations of the town (street greenery, greenery of residential areas, etc.) – their diversity, typology, quality and usability, accessibility are analysed. As a result, the existing image of Ikšķile, the forming elements of the identity and the existing greenery and spatial structure are obtained, as well as problematic situations at each level of the study are defined. The elaborated research serves as a basis for the development of the greenery concept of the populated area of Ikšķile and its villages.

1. Introduction
Cities and populated areas are complex systems which have to perform a variety of functions – economic, ecological, social, etc. [1]. At the same time, they need to create a safe, human scale
appropriate environment that encourages people to be more active outdoors, to take advantage of the activities and services offered by the city or populated area, thus also promoting economic prosperity, the formation of the socially qualitative, responsible community based on shared communication and action at the same time. These conclusions have become important keystones in the planning of modern urban space, highlighted by the world's leading urban planners who have worked on the design of such cities that are nowadays seen as examples of good practice for sustainable cities (Copenhagen, Stockholm, Malmö, etc.) [2-4].

A number of urban planners and researchers around the world have recognized the close link between positive human emotions, psychological health, and stress reduction, intensity of outdoor usage and quality, creation of a sense of belonging, and the existence and quality of greenery structure in populated areas or rural areas. Constantly urgent also are the subjects of conservation of biological diversity, environmental protection and decrease of climate changes (for example, flood risks), which are included in several European strategic and planning documents [5, 6]. Consequently, in the development plans of a number of European cities, there are increasingly involved thematic plans of the greenery structure, within the framework of which a high-quality green structure is introduced at different scales: at the scale of a municipality, at the town scale and at the local scale [7, 8]. In the context of Latvia, the development of plans for the green infrastructure is not legally defined and certain guidelines are not suitable for its development. However, the main unifying purpose of the greenery and public space concepts currently developed at the initiative of the municipalities themselves is to create a high-quality living area for residents and visitors by linking existing natural and cultural and historical values to a single network of public green spaces, thereby ensuring safe accommodation and mobility in urban areas, extending the possibilities of creating new recreational places, cycling routes and tourism routes, promoting the economic and social activity of the place, carefully organising the development and management of areas. For the development of the public greenery concept, an essential part is a part of a landscape research that creates the theoretical justification for the concept. The importance of a landscape research has been highlighted by a number of landscape researchers [9-11].

Theory based practice is most commonly used with realization projects related to environmental (nature protection, flood risk decrease, etc.) and social (social integration, public participation and involvement, etc.) issues which either use theoretical approaches or models that have already been validated or new technologies have been introduced [12, 13]. These approaches, models and technologies are based on the usage of specific data. Thus, the research part becomes an important basis for obtaining the necessary data.

The purpose of the article is to reflect the stages of the landscape research and the identifiable aspects of the landscape for the small scale populated area of Ikšķile in Latvia, which would serve as a basis for the development of the greenery concept of this town, thereby linking theory and research to practice. A three-level/scale (municipal and town, local and landscape units and elements) approach [14], based both on the research of cartographic material and field studies, has been used to explore the landscape of the town and villages of Ikšķile municipality.

2. Method

2.1. Research object – the town and villages of Ikšķile

Ikšķile municipality is located in the middle of Latvia (Figure 1) and has an area of 130.56 km². The municipality is located 25 km away from Riga and is located on both sides of the state highway (A6) and railway of Rīga-Daugavpils. The municipality and exactly Ikšķile town itself are located near Daugava and in the area where the water reservoir of Riga hydroelectric power station is formed. In 1992 Ikšķile was granted the rights of the town. In 1997 - 2004 Ikšķile municipality was created [15].
There are 8 more residential areas in Ikšķile municipality, without Ikšķile – Aizupes, Cepliši, Dobelniece, Kalnāji, Kanceru, Sauledārzē, Tinūži, Turkalne (Figure 2). The largest populated area is Ikšķile, followed by Tinūži and Turkalne, the rest populated areas are relatively small, with a population of around 100 inhabitants and fewer [18].

2.2. Research method
To perform the research of the structure and elements of the landscape space of the town and villages of Ikšķile municipality (Latvia) the entire research process was divided into three levels, successively for each level, using its own research methods:

2.2.1. The research at town level is based on two stages: first stage – cultural and historical research – analysis of historical maps, photographs, descriptions, emphasising the focus on changes in the spatial structure of the landscape, building structure forming and necessary infrastructure building, and second stage – analysis of the existing spatial structure and green infrastructure of the urban environment by cartographic materials and landscape exploration in nature (field studies). At this level of research there were identified and analysed the most important natural bases and cultural and historical elements of Ikšķile town – buildings, building structures, green spaces, as well as everyday important objects and areas distributed as “nodal points” of the town; and existing and planned “linking elements” between them – strategically important streets, walks and tourism routes. “Nodal points” and “linking elements” have been analysed in two directions at the town scale, such as everyday important and important for the development of tourism objects and areas. The result of the second stage is the prepared map with existing linkages, conflict sites, barriers, dominants and other important at town scale landscape elements, phenomenon or structures important at the town level.

2.2.2. At the local level or level of the village, there were researched neighbourhood creation, spatial and visual elements forming the identity of the area were searched in nature, as well as the overall structure of the plants was analysed. This part of the study needs a detailed exploration of the landscape in nature – expeditions. As a result schemes with the spatial structure of neighbourhoods and villages were prepared and descriptions with their natural and cultural and historical values at the neighbourhood level or village level were created.

2.2.3. Level of landscape spaces and objects – a detailed study in nature, creating photo fixations, numbering landscape spaces and describing them according to the prepared in the advance matrix (building parameters and materials used, road characteristics and type of cover, existing plants, occurring species, size of the free area that can be used for planting). A functional group is assigned at once to landscape spaces according to their functional load and in accordance with the urban planning.
– street planting, planting of residential areas, industrial areas, public areas, infrastructure areas and technical crew areas, natural areas. In general, as a result, the data on all landscape spaces of Ikšķile town were obtained by assessing each of them. Sequentially landscape spaces are divided into groups (by functional load) and sub-groups by spatial creators and size, by landscape diversity and intensity. Sequentially divided into groups (by functional load) and sub-groups by spatial indicators and size, by landscape diversity and usage intensity. The division of these groups and sub-groups is further used to describe the overall situation, identifying more typical situations, problems and providing the following sub-groups with solutions to the greenery concept.

3. Results and discussions

3.1. Town level

The part of town level research includes the research and analysis of cultural and historical development, analysis of the spatial and green structure of the urban landscape.

3.1.1. Cultural and historical development of Ikšķile. The development of Ikšķile is ancient and versatile. The facts of the history of the town and municipality of Ikšķile are reflected in the framework of the greenery concept, which have had a significant impact on the development of the spatial structure.

The Livonians’ village - Ikšķile had started development as a residential area from the time when the area was inhabited by the Livonians of Daugava. Castle mounds and ancient burial ground existent in the municipality witness of the ancient history of the area. The Livonians’ village was at this area from the 9th to 12th centuries. One of the versions of the creation of the name of Ikšķile is that it came from the words of the Livonians ikš kīla, which translation means “one village”. At this time, the development and existence of the city were ensured by its presence on an important trading path [19].

The arrival of Christianity – from the 12th century, the development of the village of Ikšķile was influenced by the decision of the missionary Maynard to build a church and castle here, which was done in 1185 [19]. Moreover, the important fact is that it was a walled castle that was, in these times, something special. The Manor Days – over the years and on strengthening the power of landlords – in 1638 manors of Ikšķile, Tīnūži, Turkalne, Sprestiņi, Pikkalne and clerical manor of Ikšķile were included in the municipality of Ikšķile. The buildings of the manor of Ikšķile were built in the 18th century. Manor buildings and brewery are in the flooded area of Daugava, and nothing in the modern landscape remained of the manor complex [19, 20].

Cottage village – the opening of Riga – Daugavpils railway in 1861, as well as proximity of Riga in the second part of the 19th century, had a positive impact on the development of the municipality in all areas. At a time when Latvia was still part of Tsarist Russia, Ikšķile began to develop as a cottage district of wealthy bourgeois. In 1874, the green areas of Ogre were divided for building cottages. The most was built in the 50s of the 20th century when Ikšķile got the look that it has now either. The parcels were divided by a village plan in which the drawn-out streets were gradually installed in nature as well. The village was designed by architect Zenta Ergle. Building areas, street arrangement, street names (33 street names were confirmed in one of the meetings) were approved in this process. Although this is a cottage area which is based on a utilitarian function, the architect, on designing the village, considered the environment formation, viewing lines, with the inclusion of the steeper slopes in planting areas rather than building up, as well as the establishment of a centre around the Nation's house [18, 20].

Time After World War I – after World War I, only a few buildings in Ikšķile were applicable for usage. After a number of hard economic financial years, life in Ikšķile was restored. On 25 September 1929, the Society of Improvement of Ikšķile was founded. At the basis of the creation of the society, there was a desire to create a comfortable environment and directly in the cottage area. The objectives included: “to provide the activities in the area for lighting, development of roads and parks”. As times changed, the association extended its activities and also focused on the development of tourism by providing for the construction of a restaurant, news office (information centre), etc., the development of a resort and the
development of the water transport movement. Alleys plantings had been organized for several years. This time is considered to be important for the development of plants, as it took place for several years in an organised way, involving specialists. At that time, 1,500 trees were planted every year, both along the streets and in groves, a place for swimming was arranged, an well organized embankment was arranged to allow walks along Daugava [18]. Time After World War II – after World War II, particularly after the electrification of Riga-Ogre railway, Ikšķile continued to develop as a cottage district of Pieriga. In 1968, it got a status of the urban village. Following the construction of Riga hydroelectric power station and the float of the water reservoir, a new highway was constructed in the 70s, which functionally and spatially divided Ikšķile into two parts – on the side of Daugava the construction of private houses continued, but on the side of the railway since the end of the 70s, the construction of apartment buildings for drainage specialists, not typical to Ikšķile expanded. At the same time, on the other side of the railway, the construction of production buildings was actively carried out by the kolkhoz “Yugla flower”. Construction of private houses in Jaunikšķile and Adamlauks continued in the 80s [18].

3.1.2. Analysis of the spatial and greenery structure of the landscape of Ikšķile town. The spatial and greenery structure of the urban landscape was analysed at the town level, which is important for the daily activities of the local residents and for the development of tourism. According to the previously developed methodology, the main formatting elements of the spatial and greenery structures of the town landscape are the nodal points and the linking elements which together must form a green network. Nodal points in the city are urban forests and parks, squares and “green pockets” (pocket gardens), recreational areas, children's playgrounds, training grounds, public greenery areas new to public buildings, residential houses and other areas, cemeteries and church gardens, cultural heritage sites, potentially developing public spaces, etc. Landscape elements which serve as a safe movement and/or a delay between “nodal points” on a daily basis, promoting recreation and tourism, while also ensuring ecological linkages, are accepted as linking element at the town level. The linking elements in the town are well organized street green zones, pedestrian and cyclist paths, watercourses and reservoirs coasts, linear natural and greenery areas, etc.

Ensuring the daily activities of residents forms the basis for improving the quality of the everyday life environment. In the context of improving the quality of daily activities and life environment of residents the nodal points and their linking elements of the town and villages of Ikšķile municipality were analysed on the basis of the following criteria:

- everyday landscape nodal points – public facilities (educational establishments, local government buildings, cultural establishments, sports areas and recreational areas, major commercial and entertainment places, etc.) that are daily frequently visited;
- everyday landscape linking elements – the most active daily used directions (streets, pedestrian and cyclist paths);
- public spaces, pedestrian and cyclist pathways to be developed in the future to ensure the daily activities of citizens.

In its turn, for the development of the urban tourism infrastructure, it is essential to ensure the safe and easily perceived approachability of tourism sites. Therefore, in the context of tourism development, the nodal points and the linking elements of Ikšķile town landscape were analysed according to the following criteria:

- important for the residents and attractive for tourists recreational sites (beach, parks, etc.), active sports areas and places for sightseeing (nature elements, building, cultural and historical sites, etc.);
- main streets and entry points into the town, “town gates”;
- scenic places where visual high-value views are displayed;
- historical roads and linkages between cultural and historical sites;
• existing and planned tourism routes and facilities, in accordance with the actions and
guidelines included in the tourism development strategy of Ikšķile municipality.

In addition to the nodal points and linking elements, areas are identified at the planning level of
Ikšķile town that should be provided with a specific approach (accessibility) – underground crossings
under the highway; environmental accessibility elements, panduss, etc. These areas are particularly
important to identify in order to establish in the future a common network of public space, accessible
to all population groups, based on the provision of daily and tourism activities. In the context of a
unified public outdoor network, the most important viewing sites are also noted where it would be
advisable to plan small recreational areas and pocket gardens. Both daily and tourist development-
enhancing landscape nodal points and linking elements, accessibility points and scenic places form the
common public outdoor and greenery structures of Ikšķile town (Figure 3).

![Image of map showing nodal points and linking elements]

The forming elements of the greenery and spatial structure of the town – nodal points, linking
elements, accessibility points and scenic places are marked and numbered in the map, as well as
described in table 1. The table shows the number and title of each of the elements on the map and
indicates whether it is important for daily activities, tourism development or both. On evaluating the

Figure 3. Analysis of the spatial and greenery structure (nodal points, linking elements, problematic
spots, scenic places) of the landscape of Ikšķile town, Latvia
creation of a common greenery structure in the context of the municipality of Ikšķile it is possible to identify and strengthen existing and create new linkages at the municipal scale. These links connect the town to its nearby nature and recreation areas.

3.2. Level of neighbourhoods and villages
Ikšķile town is divided into four neighbourhoods (Figure 4): Ikšķile, Jaunikšķile, Daugavmala, Ādamlauks (according to the spatial plan of Ikšķile municipality). There were analysed spatial landscape structure, local identity, certain landscape values, functional and visual links of each neighbourhood. The division of neighbourhoods helps to divide the town into groups of landscapes spaces with their identity, the nature of the landscape and historical development, and to plan the development of each neighbourhood separately so that Ikšķile town develops smoothly in general. Several parts of the spatial structure have been identified and distributed for each neighbourhood after the town research in nature, based on differences in the spatial structure (a total of 20 parts of the spatial structure). Parts of the spatial structure are important from a planning point of view because in each of them there is a changing existing spatial structure of the landscape and the role of landscape elements in it. Parts of the spatial structure of neighbourhoods, as an integral part of the landscape, have also been studied outside the administrative borders of the town.

![Figure 4. The neighbourhoods of Ikšķile town and their division into landscape spatial structures [16]](image)

3.2.1. Division and survey of neighbourhoods. Ikšķile town is divided into four neighbourhoods: Ikšķile, Jaunikšķile, Daugavmala, Ādamlauks (according to the spatial plan of Ikšķile municipality). There were analysed spatial landscape structure, local identity, certain landscape values, functional and visual links of each neighbourhood. The division of neighbourhoods helps to divide the city into groups of landscapes spaces with their identity, the nature of the landscape and historical development, and to plan the development of each neighbourhood separately so that Ikšķile town develops smoothly in general. Several parts of the spatial structure have been identified and distributed for each neighbourhood after the town research in nature, based on differences in the spatial structure (a total of 20 parts of the spatial structure). Parts of the spatial structure are important from a planning point of view because in each of them there is a changing existing spatial structure of the landscape and the role of landscape elements in it. Parts of the spatial structure of neighbourhoods, as an integral part of the landscape, have also been studied outside the administrative borders of the town.
3.2.2. Villages as separate units. Each village has been formed as a separate spatial unit which does not have close or direct links to Ikšķile. The closer spatial linkage has been formed for Tīnūži with Ikšķile. Tīnūži is the largest village and there is a developed transport movement between it and Ikšķile, as well as a significant road passing through the Tīnūži, which is considered to be an alternative to a highway passing through Ikšķile. Each village was evaluated in several categories – spatial structure, local identity (vegetation/plants, coverings, materials and elements), village landscape values, landmarks, dominants, functional and visual links, and existing structure of plants. The description of the current situation of each village has been supplemented by photo fictions, and the information is also illustrated schematically on cartographic material. The cartographic material is designed on the basis of the spatial planning documents to create a link to the various functional zoning and administrative borders of the village. In addition, in the maps, there are accordingly indicated areas where there is a lack of linkage or conflict areas are created: challenges to be solved further in the development of a vision and guidelines for the planned situation. In the framework of the greenery concept, eight villages in the municipality of Ikšķile have been examined, conducting landscape research and making proposals for the development of plants. The spatial structure, local identity were analyzed, landscape values, functional and visual links were defined for each village. There are prepared graphic materials with the existing planting structure of villages and a proposal on the planned structure of plants is given.

3.3. Landscape spatial level
Planning of plants by urban scale structure and planning of neighbourhood or village structures goes to the level of landscape spaces where it is important to define the values and problems of specific areas.

3.3.1. Typology of landscape spaces, division. To make it easier to work sequentially on design and planning already, then landscape space types are also adapted to planning types and aligned with urban spatial planning – a division of functional zones. In Ikšķile, as well as in the common planning system of Latvia, there are divided the following functional zones – residential building, public building, planting and natural areas, manufacturing and technical building sites, line construction sites, which are actually transport corridors. It has not been sufficiently detailed for planting research. Therefore, several of these functional zones are further divided.

| Functional zones in urban planning | Types of landscape spaces | Subtypes of landscape spaces |
|-----------------------------------|--------------------------|-----------------------------|
| Residential building              | Areas of mansion/small-floor residential building * | existing building of mansions |
|                                  | Areas of multi-storey residential building * | planned residential building |
|                                  |                                         | sections of dense/compact building |
| Public building                   | Public building            | single-standing buildings or areas of the low-density building |
|                                  |                                         | educational institution |
|                                  |                                         | Service offices |
|                                  |                                         | recreational and activity offices |
| Areas of production and technical building | Areas of production and technical building | Free space for buffered plantations 6–1 m |
| Line construction sites           | Street and road planting *       | Street and road planting – building of private houses |
|                                  |                                         | Street and road planting – multi-story building |
|                                  |                                         | Street and road planting – pedestrian streets/streets with divided one-level space |
|                                  |                                         | Street and road planting – along public, mixed division building areas |
Street and road planting – along areas of planting and nature
Street and road planting – along industrial and technical areas
Railway *
Types of railway buffer plantations depending on the size of the free area

| Plantings and natural base areas | Natural areas | Natural base areas |
|---------------------------------|---------------|--------------------|
|                                  | Water areas   | Areas of parks, squares and plantings |
| Human-made areas                 | Cultural and historical and specially protected objects and areas |
|                                  | Cemetery sites |
|                                  | Short-term plants |

* Specific situations have been identified, related to site accessibility for plantings in addition to each sub-type.

### 3.3.2. Spatial models and descriptions of landscape spaces.

For each subtype of the typical landscape space, there are also drawn spatial models that demonstratively show the existing spatial structure and problems of the landscape. Since it is not possible to include all prepared materials in the article, only a few of the examples are included (Figure 5, Figure 6, Figure 7).

**Figure 5.** Two typical situations in the structure of private house landscape spaces [15]

The largest part of the area of the town and villages of Ikšķile municipality is occupied by the building of private houses, which also forms the identity of Ikšķile – a small-scale space with private buildings and gardens joint to them. There are typically two situations in Ikšķile: the building of private houses with the marked relief, consisting of slopes of a river and buildings in straight relief shaped in meadows, without terrain and with rare plantings. For example, for transport corridors, there are modelled existing situations with different building patterns in surrounding areas and with potential plants of different free areas.

**Figure 6.** Three typical situations around the roads near the building of private houses and multi-storey buildings [15]
In the areas of private house buildings, there are 2-6 m free lanes on both sides of the road tracks. The existing planting structure consists of separate wood plants (adult birches, pines, chestnuts, rowan-trees) or groups of bushes, hedges. There is no pavement; there are no elements of improvement. In multi-storey residential areas, street plantations along multi-storey buildings do not constitute a single structure of plants, so they do not always perform their functions. There is a variable width of the free zone, in which a variety of plants – fragments of lane plantations, rows of bushes and groups appear in fragments.

![Diagram](image)

**Figure 7.** Some of the typical situations in the public nature areas where one of the forming elements are terrain and building, as well as existing plants [15]

### 3.4. The existing image of the city and villages of Ikšķile

There are already a number of important cultural and historical and natural objects in the town and villages of Ikšķile municipality, which serve as a basis for the development of a single structure of plantings, by creating linking elements between them, together with appropriate infrastructure, and by paying particular attention to improvement, grooming and available information. As the largest groups of values that make up the image of Ikšķile there can be divided:

- the landscape space of the river Daugava and its accessibility – on the one hand, one of the higher values of the extensive open landscape, on the other hand, barrier and flood-threatened areas with their original vegetation;
- cultural and historical values, objects – several objects that form the image of Ikšķile and are the basis for the recognition of the area – these are both monuments, churches, manors, their ruins and other elements or their complexes;
- diversity of existing tree species in both openly available and private plantings – diversity of vegetation links to different relief, different types of the natural landscape in the environment and the diverse structure of existing plants, where pine forests vary with groups of leaf trees, vegetation of river banks vary with the diverse structure of private houses greenery;
- separately well-organized objects /areas – human-made areas that focus more on the central part of the urban environment and represent a significant part of the public outdoor.

Potential solutions to the problem issues/places play an important role in the development of the concept of the greenery of the city and villages of Ikšķile municipality. The issues to be resolved are grouped according to a number of parameters, identifying and identifying the main problems not the weaknesses of each individual landscape space. Following issues to be resolved have been identified for the existing planting structure after exploration in nature:

- fragmented urban space and planting structures without marked elements of identification/landmarks/dominants;
- there is a lack of safe and attractive links between major areas that limit their availability;
- there is a lack of safe connection between urban neighbourhood and neighbourhoods and centres, parts of the town divided by transport corridors (highway, railway);
the arrangement of plants and environmental objects on entering the town, central part of the

town and village centres does not form the identification and representativity of the area;

highlighting the identity of neighbourhoods;

a lack of plants and buffer plantation – the green area along A6, the beach, the greenery and

environment of the main urban streets;

a lack of environment and planting – Park Street planting area, courts of multi-storey houses,

promenade of the levee of Daugava, memorial sites.

4. Conclusions

Landscape research provides an important basis for further development of the public greenery

concept if it is based on certain principles and criteria. This allows gained results to be grouped and

interpreted, on highlighting essential values and main problems that should be included and resolved

during the development of the greenery concept.

A three-level/scale approach in the landscape research allows identifying the specific issues to be

resolved for each scale that can be successfully included not only in the greenery concept, but also in

already existing municipal regulatory documents, which are also related to different planning scales.

In landscape research at town scale, there are identified the issues related to the landscape

fragmentation – separately arranged, unconnected nodal points of the town (major public areas) and

interruptible or non-existent linkages between them. It is also possible to identify places where

connectivity and accessibility need to be resolved. On assessing the spatial structure of the landscape,

it is possible to identify potential landmarks in the town or their absence.

At a neighbourhood scale, the most important research task is to identify the specific characteristics

and identity-forming elements of each neighbourhood, which can later be included as key elements in

the greenery concept.

At the scale of the landscape units and elements in the landscape research, the specific character of

different urban functional zones is shown, their relevance to the principles of creating a modern

qualitative environment. The research at this level is directly of vital importance for the development

of already specific actions/tools and their inclusion in the relevant legislative instruments.

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References

[1] M.A. Benedict, and E.T. McMahon, “Green Infrastructure: linking landscapes and

communities,” Washington, D.C., Island Press, 2006Z. A. Latif, I. Zamri, and H. Omar,

“Determination of tree species using Worldview-2 data,” 2012 IEEE 8th Int. Colloq. Signal

Process. Its Appl., pp. 383–387, 2012.

[2] City of Stockholm, “Stockholm City Plan,” [Online] 2018 [Accessed 21.03.2020. Available at:

https://vaxer.stockholm/globalassets/tema/oversiktplan-

ny_light/english_stockholm_city_plan.pdf.

[3] M. Surma, “Green infrastructure Planning as a part of Sustainable Urban Development – case

studies of Copenhagen and Wroclaw,” Proceedings of the Latvia University of Agriculture

Landscape Architecture and Art, Vol. 3, Nr. 3, pp. 22-32, 2013.

[4] City of Copenhagen City Hall “Copenhagen: solutions for sustainable cities,” [Online] 2014.

[Accessed 21.03.2020. Available at:

https://international.kk.dk/sites/international.kk.dk/files/Copenhagen%20Solutions%20for%20Sustainable%20cities.pdf
[5] European Union, “The EU Biodiversity Strategy to 2020,” [Online] 2011 [Accessed 21.03.2020.] Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52011DC0244.

[6] European Commission, “Green Infrastructure (GI) - Enhancing Europe’s Natural Capital,” 2013. [Accessed 21.03.2020.] Available at: https://eur-lex.europa.eu/resource.html?uri=cellar:d41348f2-01d5-4abe-b817-4c73e6f1b2df.0014.03/DOC_1&format=PDF

[7] “Green infrastructure and open environments: the all London green grid. Supplementary planning guidance,” Greater London Authority [Online] 2012 [Accessed 21.03.2020.] Available at: https://www.london.gov.uk/sites/default/files/algg_spg_mar2012.pdf.

[8] M. Richter, and U. Weiland, (eds.) “Applied Urban Ecology: A Global Framework,” 235 p, 2011.

[9] J. Ahern, “Theories, methods and strategies for sustainable landscape planning,” Tress, B., Tress, G., Fry, G., Opdam, P. (eds.). From landscape research to landscape planning: Aspects of integration, education and application. Springer, pp.119-131, 2005.

[10] A. James, and Jr. LaGro, “Site Analysis: A Contextual Approach to Sustainable Land Planning and Site Design,” Wiley, 2008.

[11] R. Saffuana, K. Zanudinb, and P. Ahmadc, “The Evaluation of Green Infrastructure Elements to Enhance Green Neighbourhood Park in Shah Alam, Selangor,” Proceedings of the 1st International Conference on Research Methodology for Built Environment and Engineering, Kuala Lumpur, Malaysia, IOP Publishing, 2013.

[12] N. Rottle, and K. Yocom, (eds.) “Basics Landscape Architecture 02: Ecological Design,” AVA Publishing, 2011.

[13] T. Pinto-Correiaa, and L. Kristensenb “Linking research to practice: The landscape as the basis for integrating social and ecological perspectives of the rural,” Landscape and Urban Planning 120, pp. 248–256, 2013.

[14] N. Nitavska, D. Zigmunde, and M. Markova, “Conception of Green Infrastructure as a Tool of City Development Planning,” WMCAUS 2019. IOP Conf. Series: Materials Science and Engineering 603, 2019.

[15] Latvia University of Life Sciences and Technologies, Environmental and Civil Engineering faculty, Landscape Architecture and Planning department, “Ikšķile city and vilage green infrastructure concepcion,” [Online] (in Latvian) [Accessed 21.03.2020.] Available at: https://www.iksikile.lv/sites/default/files/inline-files/iksikiles_pilsetas_un_ciemu_apstadijumu_koncepcija_.pdf.

[16] Esri HERE Garmin © OpenStreetMap contributors, and the GIS user community.

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[18] SIA Metrums “Ikšķile municipality spatial plan for 2011–2023 1st edition (in 4 volumes) Volume 1,” (in Latvian) [Online] 2010 [Accessed 21.03.2020.] Available at: http://www.metrums.lv/data/files/teritoriju_attistibas_planosana/iksikile/Paskaidrojuma_raksts_12_07_2011.pdf.

[19] J.K. Broce, “Drawings and descriptions. No: 3. volume Small towns and countryside of Latvia,” (in Latvian) Rīga: Zinātne, 2002.

[20] V. Villerus, “Ikšķile almanac. Dedication to the 825th anniversary of Ikšķile. Release 3,” (in Latvian) Ikšķile, 2010.