



SZENT ISTVÁN UNIVERSITY

**USING A LANDSCAPE ARCHITECTURAL APPROACH TO
CATEGORIZE AND ASSESS SETTLEMENT FRINGES**

Main findings of the PhD thesis

ZSÓFIA FÖLDI

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Doctoral school: Szent István University
Doctoral School of Landscape Architecture and
Landscape Ecology

Research field: agricultural engineering

Head of

Doctoral School: László Bozó
Professor, DSc, MHAS
Szent István University
Faculty of Horticultural Sciences
Department of Soil and Water Management

Supervisor: Zsuzsanna Illyés,
associate professor, CSc
Szent István University
Faculty of Landscape Architecture and Urbanism
Department of Landscape protection and reclamation

.....
Head of Doctoral School

.....
Supervisor

HISTORY

The focus of my research is the interpretation of the settlement fringe from a landscape architectural point of view. The settlement fringe is a visual element of the landscape, though its structural interpretation and its treatment as a planning tool have not previously been analysed. Landscape architectural tasks mainly focus on larger landscape details, on landscape planning proposals, or on the tasks to be solved within the built-up parts of the settlement, especially the green space system. My practical and professional experience confirms that although landscape architecture recognizes the prominent role of settlement fringes, this landscape element has thus far not been well-defined in practice. Domestic landscape architecture has not yet developed a rigorous method for defining the professional tasks around settlement fringe organisation.

I am convinced that landscape architecture can play an important role in the rethinking of settlements and their surroundings, as well as the fact that settlement fringes are to be treated as an area of priority. The formulation of landscaping tasks for this specific area can help make this sensitive area act as an intermediary zone between the landscape and the settlement. Through conscious design, the settlement fringe can become a more valuable part of the landscape in terms of the use of landscape structure, landscape ecology, and scenery.

The objective of the research is also of current interest due to the European Landscape Convention / National Landscape Strategy; the national landscape character research and the professional tasks arising in the Hungarian settlement planning practice. Settlement image handbooks and settlement regulation further make it actual.

OBJECTIVE, TASKS

The research is based on the **assumption** that a **settlement fringe is an identifiable, demarcated, and distinguishable adjacent area of an existing landscape element to be treated according its function and characteristics.**

The **main objective** of the doctoral dissertation is to **interpret the structure** of the settlement fringe and determine its **landscape structure and features, as well as its green surface, and the interconnections** of these elements, and by using this knowledge, to **interpret the settlement fringe from a landscape architectural point of view**, and with it the **tasks** and possible solutions for the settlement.

In order to achieve my scientific objective, I carry out the following **tasks**:

- **explore** the interpretation and examination of settlement fringes in different research areas by reviewing international and national literature;
- **systemize** the characteristics of the domestic settlement fringes based on literature and existing map stocks;
- **analyse** the domestic situation of settlement fringe arrangements by reviewing the domestic planning system;
- **develop of a method** for examining and assessing settlement fringes;
- **conduct a landscape architectural interpretation** of the settlement fringe using the developed method to the sample area:
 - **define the structural elements of a settlement fringe**
 - **describe landscape use, green surface, and landscape character;**
- based on the results of the plot area, **draft planning recommendations for landscaping possibilities of the settlement fringe** in order to integrate the landscape management of settlement borders into the practice of settlement planning.

MATERIAL AND METHOD

The research is divided into three parts. In the first part, I examine the way in **which existing literature and research** interpret the settlement fringe and its applicability in landscape planning.

The second part of the research looks at the settlement fringe in Hungary, which is based on literature review, develops a data set, and reviews design practices. The **literature review** helps to understand the history of the Hungarian settlement fringe. The **creation of a data base** is aimed at recording the data describing the borders of the settlements using existing map stocks (basic maps). Through statistical analysis of the data, I analyse the green surface relationship of the intersection of the settlements and the host landscape. By **reviewing the planning practice**, I provide a critical analysis of the planning tools that affect settlement fringes. Further, in this section I formulate and showcase the general results and hypotheses.

The third part of the research is the **sample area research**, where I apply the research method developed for the verification of my hypotheses in the sample area. The method is based on the creation and processing of a data set as well as perceptual examination.

The primary source for mapping the current state of the sample areas are aerial photographs. Using the aerial photographs, I **record** the landscape structure of the settlement fringe, as well as its green surface characteristics. The aerial analysis is complemented by the use of thematic maps, documents and databases (settlement planning tools, urban imagery guides, forest map). In order to shed light on the inter-connections of the various data regarding the delimitation of the settlement fringes' characteristics, I carry out **statistical analyses** and allocate settlement and landscape features to the results. The **perceptual study** aims to record the settlement fringe's landscape features in a scientific way. Throughout the field research I make systematic recordings based on a protocol, during which I log the characteristics of the built-up environment and the circumstances of their perception. By organizing the observed information, I determine the landscaping

role of the natural elements of the settlement fringe. In this section I present **new findings** in the field of landscape architecture.

When **choosing the sample settlements**, I selected those that have not grown together with other settlements, that do not have population in excess 5,000 (according to KSH data of 2018), maintained their compact structure, and are situated in a transforming and developing area but are only slightly affected by them. Therefore, in my research I deal with settlements that are relatively closed, have a compact structure, are moderately growing, and typically settled edges. I ensured that the settlements in the sample study are located in an area in which the settlements show variations regarding their natural characteristics and therefore form groups of settlements with different natural conditions. This choice provided an opportunity to examine the different characteristics of settlement fringes and to identify similarities and relationships within settlement groups. Accordingly, the **subject of my research** is the settlement fringe of 21 settlements from six different sectors of the Budapest agglomeration. From the northern sector of the city: Csomád, Csörög, Sződ, Vácrátót; from the south-eastern sector: Upper Pakony; from the southern sector: Majosháza, Pusztazámor, Sóskút; from the western sector Herceghalom, Perbál, Tinnye; from the north-western sector Csobánka, Dunabogdány, Pizsi, Pócsmegyer, Szigetmonostor, Visegrád.

SCIENTIFIC RESULTS

Thesis 1. Applicability of settlement fringe interpretations.

I found that different scientific fields use methodological elements approaches similar to the landscape architectural approach: the zonal interpretation, the examination of the settlement and landscape "side", the analysis of their interaction, and how the typology should be defined. In contrast, related research focuses investigating mechanisms influencing the field, rather than on the delineation and structural interpretation of the settlement fringe. It is important that the settlement fringe is defined as a spatial element in order to arrange the relationship between the settlement and the landscape in a rigorous way. For the purposes of landscape architecture, the settlement fringe should be considered as a landscape strip with a variable width, where both, the enclosing landscape and the features of the built-in construction can be interpreted. Following the interpretation of the underlying landscape planning, not all of the edges of built-in structures can be considered as settlement fringes. The morphological interpretation of the settlement boundary is determined by the settlement structure position, the stability and the size of the settlement.

Thesis 2. The domestic characteristics of the settlement fringe's landscape strip interpreted through a landscape architectural approach.

Settlement fringe is a historical phenomenon that appears in the 17th century as the constraints of limited growth and physical enclosure subsided. As restrictive factors waned settlement growth intensified. The outskirts of the town become characterized by a process of continual renewal, as well as a qualitative change. This qualitative change is shaped by its link to the landscape: the protection factor implies a built-in element, the functional attachment of farming and the appearance of a green border around its functional detachment from the landscape.

I proved the appearance of the green fringe in the case of the domestic clear patches of 100-300 hectares (630 pieces). Within this municipal size range, the

proportion of green areas that make up the fringe is predominantly above 25%. With respect to the settlements' green fringe proportion, typical densification can be observed. The clusters suggest that the densification of the green areas that make up the fringe is a consequence of functional detachment from the landscape. Both types of fringes, those with a lot of green space and those with little green spaces, indicate the characteristics of the surrounding landscape.

Thesis 3. Critical analysis of planning tools affecting settlement fringes.

I found that the settlement fringe is not interpreted and demarcated as a planning unit in the domestic planning system. The difficulty of managing the settlement fringe in the current planning system and planning practice can be found in the spatial interpretations and planning units. Urban planning practice currently operates according to units of peripheral / central and built environment / inclusive landscape. The settlement fringe represents the intersection of these two units, synthesizing settlement and landscape conditions. However, a planning tool that manages the settlement fringe on a settlement and landscape level is missing. As a result, there are little systematized responses to the disordered relationship between built and unbuilt areas. The optimal land use ratio can only be regulated and maintained within the limits of the site plan in a very cumbersome manner which yields poor results. Recognizing this justifies the need for a new design tool.

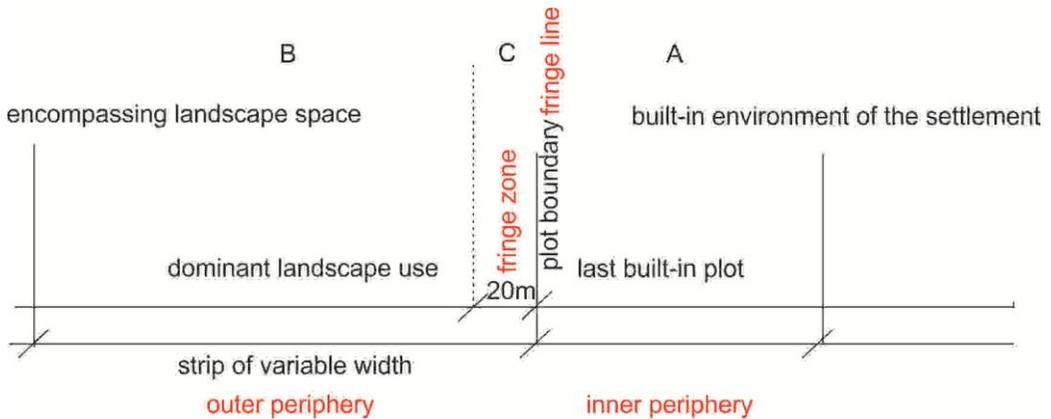
Thesis 4. Structural interpretation of the settlement fringe.

I determined the settlement fringe's demarcation and its functionally separated structural elements from a landscape architectural perspective. I demonstrated the correlation and factors of these structural elements through a pilot study.

Structural elements of the settlement fringe:

- fringe line: the real boundary of the compact settlement area
- inner periphery (A): the last built-in area

- outer periphery (B): variable width of the denoted landscape strip measured from the plot boundary, actual size to be proportional to settlement size
- fringe Zone (C): a 20-meter denoted strip from the land border



Thesis 5. Determination of the landscape structure features of settlement fringes based on sample area research.

The function of the inner periphery fringe is similar settlement's transportation network and economic space. The land use of the outer periphery is adapted to the natural environment, and its characteristics influence the structure by of providing or impeding openness. The fringe zone is a structurally separate landscape element of the settlement border. Thus, the structure of the settlement fringe is influenced by the natural spatial system in which the settlement is formed, as well as by the farming traditions that continue to exist in the settlement, and the involvement of the settlement with the transportation network. The structure of the sample settlements is primarily shaped by the importance of proximity to the natural spatial system and the importance of coverage.

Its functional detachment from the landscape (new settlement features) results in the appearance and varied design of the fringe zone.

Edge tangency shows correlation with the size, morphological characteristics, and functions of the settlement.

Thesis 6. Determining the characteristics of the green area of the settlement fringe based on field studies.

The **tree stands** of the functionally separated structural elements of the settlement fringe complement each other and combined, they form the characteristics of the settlement fringe's green surface character. Eventually, it is **perceived as an intertwined closed system**, which is the result of the approach to the natural spatial system, the efforts of municipal afforestation, spontaneous shrub initiation at the outskirts of the settlement, or obstruction.

The proportion of green space elements in the sample settlements and the encompassing landscape is large in the fringe zone, with 50-75% as the defining value. The sample plot results also **confirm the existence of the settlements' green fringe** and the discovery that the attitudes towards the landscape and the settlement functions influence the density of the green areas forming the border.

Thesis 7. Determination of green surface edge types based on model research.

The system of the green areas of the settlement fringe can be classified into different types. The typology is determined by the hierarchy between the structural elements that make up the green spatial system. Based on this, the following patterns can be described: leaning on an outer green ring, made of intermittent / island-like elements, blending into the outer green ring, built on an inner green ring. The occurrence of green surface border types shows a variety of landscape units. The typology groups provide an opportunity to determine the development and management objectives of the green space related to the settlement's integration into the environment.

I classified the green gates (the part of the watercourses that interweave the settlement along the edge of the settlement) based on the green surface pattern. I identified four types: embedded, green-surface replacement, inverse-internal replacement, inverse-external replacement. Regardless of the natural conditions, in 46% of the coverage of the two sides (municipal and landscape), the green gates of the sample settlements are

opposing. On the settlements' outskirts, green surface continuity is typically blocked along intersecting watercourses. The settlement fringe is a transforming factor. The structural interpretation of the settlement fringe and its treatment as one of the landscape structures can also help the nodal management of the natural elements entering the settlement, which supports the continuity of the green surface.

Thesis 8. Determining the landscape features of the settlement fringe based on pilot studies.

I found that the natural elements of the settlement fringe play different roles in the formation of the settlement gates in connection with the terrain.

The settlement fringe plays an exclusive role in how it fits into the landscape of the lowland settlements, with the built-up character of the inner periphery and the tree stands determining the quality of the settlement. In the settlements of the lowlands, 87% of the settlements' tree stand is the forming element of the settlement gate. The integration into the landscape can be ensured by managing the natural elements of the settlement fringe.

The settlement fringes of the higher lands do not play the role of settlement gates. In their case, sensitive unfolding situations can be identified.

Thesis 9. Landscape architectural interpretation of the settlement fringe.

Based on the studies of sample areas, I determined the structural interpretation of the settlement fringe. I see the landscape architectural possibilities of: the implementation of the principles of landscape planning; the built environment and the surrounding landscape in the delimitation of the settlement fringes I defined; the joint management of the built-in and the unbuilt landscape strip; highlighting of the fringe zone

Through the research of the sample areas, I proved that the settlement fringe is an element of the landscape to be treated with priority. It is to be treated with priority as a landscape unit, as a green surface element, and as a landscape feature.

Based on the landscape structure, green surface, and landscape features, I made a landscape architectural interpretation of the settlement fringe. In my interpretation, a settlement border is a variable-width landscape strip defined by the built-up area and the receiving landscape, which consists of functionally separable structural elements. The connection of the structural elements and the quality of the green surface depends on the landscape utilization, green surface and landscape aesthetic relationship of the built and unbuilt landscape strip. Consequently, it functions as an intermediary zone between the landscape and the settlement. The settlement fringe is, thus, an important domain of how settlements organize and fit within the landscape.

Thesis 10. Landscape design possibilities of the settlement fringe.

In terms of its function, the settlement fringe is an “intermediary zone”, with its condition influencing the quality of the connection between the settlement and the landscape, both in terms of landscape structure, green surface and landscape. According to this, the principle of landscape planning related to settlement fringes is to preserve or achieve conflict-free or more favourable connections. This can be achieved by taking care of the role of settlement fringes in determining the landscape structure and influencing design of the settlement. Achieving the goals of landscape management can be realized through the coordinated management of how landscapes and settlements.

I found that the landscape planning tasks related to the settlement fringe should focus on the management of ecologically sensitive junctions, the settlement of “deficient” relationships and the development of visual and green gates. The main tool of landscape management is the formation of edges, especially the management of the municipal green border. The fringe zone is a priority area for the settlement’s inclusion into the landscape.

CONCLUSIONS AND RECOMMENDATIONS

My interpretation of the settlement fringe and its characteristics regarding the landscape structure, green surface, and landscape offers a new approach to landscape planning research concerning settlement planning.

The structural interpretation of the settlement fringe facilitates the understanding of the relationship between the settlement and the landscape.

The border zone is a structurally autonomous landscape element of the settlement fringe. Its recognition and conscious formation is an important element of landscape protection.

The results highlight the appearance of the municipal green border and the need for landscape protection treatment.

The evaluation method used to determine the characteristics of the settlement fringes and the principles of settlement planning can serve as a basis for landscape planning guidance that extends the current practice of settlements and includes the landscape of the settlement.

The results support the introduction of new research aspects of green space system design and the necessity of extending urban planning tools.

The research method used in the sample area can be used in the green surface system design and local building regulatory processes. The pictures taken during the field study serve as a monitoring point. The exploration of the landscape features of the examined settlement fringes helps to expand the examination aspects of the settlement imagery handbook.

Possibilities for further research include how the established principles are suitable for studying the settlement fringes of other sized settlements (e.g., large cities).

THE AUTHOR'S PUBLICATIONS

Scientific periodicals and conference proceedings:

Kabai Róbert - **Földi Zsófia** (2011): Limits to settlement expansion from a landscape perspective. *The Problems of Landscape Ecology Vol. XXX, Four Dimensions of Landscape*. Faculty of Geography and Regional Studies University of Warsaw and Polish Association of Landscape Ecology. Varsó. 2011. szeptember 15-17. pp. 343-346 (ISSN 1899-3850)

Földi Zsófia (2011): Unique landscape values occurring on settlement fringe. *Acta Universitatis Sapientiae. Agriculture and Environment - Contents of Volume 3*. pp. 156–165. (ISSN 2065–748X, online: 2068-2964)

Földi Zsófia (2011): Jászberény településszegélyén található egyedi tájértékek tájképi jelentősége. *Tájvédelmi Füzetek. 1. szám*. pp. 43-54. (ISSN 2062 6428).

Földi Zsófia (2011): Településszegélyek környezetvédelmi szempontú értékelése. In: Dr. Imre Balázs (szerk.): *E-tudomány*. E-tudomány Egyesület. Budapest. 2011. (ISSN 1786-6960)

Földi Zsófia (2012): Mogyoród településszegélyének környezetvédelmi szempontú értékelése és tipizálása. *Tájvédelmi Füzetek. 2. szám*. pp. 81-88. (ISSN 2062 6428)

Földi Zsófia (2012): Types of the settlement fringe in respect of settlement expansion focusing on landscape protection and ecology. pp. 69. In: Jana Zapletalova – Antonin Vaishar: *Multifunctional rural development*. Mendel University in Brno. Czech Republic. 2012. September 3-7. (ISBN 978-80-7375-642-0)

Földi Zsófia (2013): Történeti településszegély-típusok. pp. 620-625. *Elektronikus könyv. Professzorok az Európai Magyarországi Egyesület*. (ISBN 979 963-884-338-8)

Földi Zsófia – Gurdon Balázs – Nádasy László (2014): A város és folyó kapcsolatának vizsgálata a víziturizmus fejlesztési lehetőségeinek szempontjából. *Tájakadémia – IV. Időszerű Tájrendezési Feladatok*. pp. 111-122. (ISSN 2062-7688)

Illyés Zsuzsanna – Pádárné Török Éva – Nádasy László– **Földi Zsófia**– Vaszócsik Vilja –Kató Eszter (2016): Tendencies and future of urban sprawl in two study areas 14nt he agglomeration of Budapest. In. *Landscape & Environment 10 (2)* pp. 75-88. (ISSN 1789-7556)

Földi Zsófia (2017): Településszegély tájkaraktert meghatározó tényezői. pp. 171-176. In: Blanka Viktória - Ladányi Zsuzsanna (szerk.): *Interdiszciplináris táj kutatás a XXI. században. A VII. Magyar Tájökológiai Konferencia tanulmányai*. (ISBN 978-963-306-542-6)

Illyés Zsuzsanna - **Földi Zsófia** - Jákli Eszter - Kató Eszter - Nádasy László (2018): Tájkaraktérből településképi arculat, a régi buda szőlőterületeinek átalakulása. In: *4D Tájépítészeti és Kertművészeti Folyóirat*. (48).

Illyés Zsuzsanna - **Földi Zsófia** - Varga Dalma (2019): New Results in Surveying Landscape Character and Urban Green Areas. In: *Proceedings of the Fábos Conference on Landscape and Greenway Planning*: Vol. 6. Article 47

Part of books

Földi Zsófia (2012): Settlement fringe categorization in respect of landscape capacity. pp. 77-83. In: Anna Czinkócky – S. Kerekes – Sz. Podruzsik (editors): *Economical, social and landscape aspects of sustainability and liveability*. Corvinus University of Budapest. 2012. (ISBN 978-963-503-501-4)

Földi Zsófia (2012): Településszegélyek tájvédelmi feladatai. pp. 197-205. In: Szenteleki Károly – Szilágyi Kinga (szerk.): *Fenntartható fejlődés, Élhető régió, Élhető települési táj. 3. kötet*. Budapesti Corvinus Egyetem. 2012. (ISBN 978-963-503-506-2)