EVALUATION OF NON-FOREST WOODY VEGETATION ALONG ROADS IN THE RURAL LANDSCAPE

Gabriel Kuczman, Denis Bechera, Attila Tóth
Institute of Landscape Architecture, Faculty of Horticulture and Landscape Engineering, Slovak University of Agriculture in Nitra, Tulipánová 7, 949 76 Nitra, Slovakia

https://doi.org/10.11118/978-80-7509-831-3-0110

Abstract
Linear tree formations in settlements represent an important biological element in the built-up area system. Along roads they are often the only elimination element of negative factors. They can significantly affect the climate-regulatory features of public space, safety and fluidity of road traffic in case of traffic guidance and visual support of important rural elements, as well as the elimination of surrounding construction elements. At present, many settlements are marked by the significant influence of the past, when woody plants were planted primarily to create phytomass without a more detailed respect to authenticity, regional specifics, originality and composition in the streets. Roads were often perceived as linear transit components of urbanism. Demonstrations of the resulting diversity from the point of view of the woody plants age stage, originality, as well as proportional-spatial properties of the species, result in different fulfilment of the functions of the accompanying green roads. The visual and functional quality of the trees and its composition are reflected in the resulting roadside vegetation structure, which was the subject of the evaluation, as well as their fulfilment against the defined basic functions of roadside vegetation in the rural area. For comparison, model areas in the same landscape type with a similar urban structure were selected.

Key words: countryside, rural renewal, rural public spaces, road vegetation

Introduction

Linear green elements, accompanying greenery of roads, watercourses and areas in rural settlements have an important role and should also fulfil the functions of greenery in settlements. The high frequency of movement in a given type of functional zones serves not only for the movement of the population but is also important in terms of connecting important centres in the settlement, facilitating and increasing safety in the public space as well as improving and optimising sanitary conditions, climatic conditions and the length or quality of people's stay in these spaces (Mareček, 2005), (Rózová, Tóth, Pástorová, 2021). Currently, linear green space elements are little understood as places where people spend time and are seen as necessary routes that they have to pass to get to other functional zones (Bihuňová, Supuka, Tóth, Šinka, Kuczman, 2021). The street has only a kind of complementary meaning within the green network in the urbanised environment, which is also reflected in the different current state of the green space, as well as the actual landscaping, composition and overall character of the place. Differences are perceived at the level of quality but also quantity of green space (Rózová, Supuka, Klein, Jasenka, Tóth, Štefl, 2020), (Tóth,Kuczman, Feriancová, 2016). They are manifested in different ways in lowland, basin and mountain landscape types, where there are also different spatial parameters of public spaces (Rózová, 2001). Streets also differ based on their location within the plan-genetic structure of a given settlement, and a main street is perceived differently from a secondary street or a local road. The most important road within a settlement is the main street, which usually passes through the centre of the development, divides the settlement and also fulfils a certain axial continuity with the dominant feature of the settlement, usually a church, manor house or other significant building (Feriancová, Kuczman, Tóth, 2012). The continuity with significant buildings is also often historically supported and the street thus has a historical connection with the development of the settlement, the frequency of movement as well as the use itself (Mareček, 2005). This paper focuses on the assessment of the current state of just linear green space elements located in selected model areas of settlements of lowland landscape type of the Slovak Republic. The selected model territories are the main streets, which also define the character of the built-up area and the overall plan-genetic structure of the settlement, which is typical for the lowland landscape type of the Slovak Republic (Bechera and Kuczman, 2020).

Materials and methods

The model territories for the paper are rural settlements in the lowland landscape type of the Slovak Republic, located in the Trnava region, under the Little Carpathian Mountains in the Trnava Hills. The selected settlements are Smolenice and Dolná Krupá and their main roads.

Picture 1: Views of the researched areas. Author: Bechera, 2022
Location of settlements in western Slovakia. (mapka.gku.sk, 2022) Smolenice (A1) Dolná Krupá (A2)

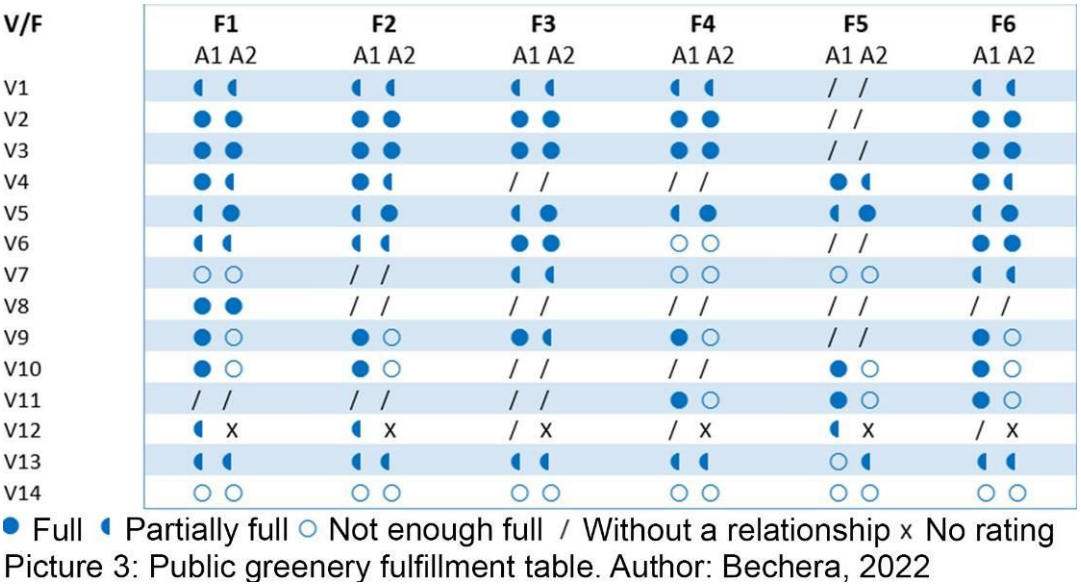
The selection criteria were the same type of SR landscape, similar intensity in terms of traffic and use - the selected roads (Smolenice - class II. road No. 502, Dolná Krupá - class III. road No. 1299), visual and functional connectivity to the dominant feature of the settlement (in both cases the church in the centre of the settlement), the two-sided built-up area together with the two-sided linear greenery that was located on the studied area of the territory. In order to achieve objectivity and comparison of the current situation, the criterion was also the choice of the length of the surveyed area, which was 470 m in Smolenice (location: SNP Street from the intersection of Cintorínska and SNP Streets to the house No. 47/2) and 539 m in Dolná Krupá (location: Hlavná Street from the house No. 15/228 to the house No. 48/160).

The current state of greenery was analysed, assessed and evaluated on the basis of the methodology for the assessment of the composition of trees in public spaces of rural settlements of the Slovak Republic (Bechera, Kuczman, 2020). The methodology, which was used in the research of the selected spaces, tracks the current state of tree composition (trees and shrubs) in the space in relation to the functions of green space in rural settlements based on the influence and relationships of the characteristics of tree composition and the functions of public green space. The tree composition characteristics are divided into 14 categories and separate elements V1 - V14. The tree composition traits are abbreviated as follows: V1 - tree cover, V2 Tree height potential, V3 Shrub height potential, V4 Visual connectivity, V5/ Composition, V6 Species diversity, V7 Species authenticity, V8 Originality, V9 Shape, V10 Colour, V11 Utility, V12 Cultural-historical value, V13 Developmental stage, V14 Tree vigour. The methodology monitors the relationships and the effect of the current state of the characteristics of tree felling on the functions at the level of efficiency and utilization, specifically on 6 functions of public green spaces in rural settlements, namely: F1 Aesthetic-representative function, F2 Proportional-spatial function, F3 Climatic-regulatory function, F4 Eco-stabilizing function, F4 Cultural-social function, F5 Traffic-safety function. The final stage of the methodology is the determination of the fulfilment of functions on the basis of individual characteristics, thus objectifying the current state of tree felling from different perspectives and identifying three categories of functional efficiency, which are. The performance of each function is evaluated based on the percentage of each grade as well as a selective assessment of the individual characteristics within each function F1-F6 (Bechera and Kuczman, 2019).

Picture 2: Views of the researched areas - current state. Author: Bechera, 2022
Smolenice (A1) Dolná Krupá (A2)

Results

The methodology is based on the analysis of input data, which is crucial for the objectivity of the assessed area as well as the accuracy of the results. The input data follow the real state of the tree composition in terms of the characteristics of the tree stock V1-V14 as well as the areal-spatial parameters of the studied area or functional zone. The monitored parameters are the areal area of potentially or actually used area for planting or existence of green areas in various forms. Subsequently, by comparing the total area and the area used by greenery (areal tree cover), a percentage of the current state of cover and use is determined. By processing and completing the input data, the KQ quality category of the current condition is determined, from which the classification of the functional efficiency in the individual green space functions is also determined. The results for the model areas in the settlements of Smolenice (A1) and Dolná Krupá (A2) are summarised in the summary table. Explanatory notes to the table - fulfilment and degree of fulfilment of the effectiveness of the tree composition in the required characteristic in individual green space functions.



Picture 3: Public greenery fulfillment table. Author: Bechera, 2022

The results show that the prime results were obtained for the model area Smolenice (A1) in functions F6 (● - 58,34% ◖ - 33,3% ○ - 8,36%), F1 (● - 46,15% ◖ - 38,46% ○ - 15,38%), F2 (● - 45,45% ◖ - 45,45% ○ - 9,1%). The achieved results are mainly in terms of a relatively significant mass of green vegetation in the area, which is made up of suitable deciduous trees, a relatively high coverage of the area is achieved at the level of mainly trees and complementary shrubs. The street greenery is compositionally appropriately distributed and creates a street space also with a residential function, which is also supported by trees with historical context and a link to sacral monuments. The trees in the space are quite vigorous and age-appropriate, which is reflected in the relatively significant phyto-matter in the predominantly green shades of the tree leaves, which looks very natural. The prime results for the model area Dolná Krupá (A2) were achieved in functions F3 (● - 44.44% ◖ - 44.44% ○ - 11.12%), F1 (● - 33.34% ◖ - 33.33% ○ - 33.33%), F6 (● - 33.34% ◖ - 33.33% ○ - 33.33%). The results achieved are mainly in terms of regularly spaced green space in the street space and relatively effective dust capture by the trees. In terms of aesthetics, the street performs well especially in terms of understanding the integrity and guiding the observer. The safety fulfilment is at a high level as the trees form a separating mass, which can also be understood negatively in terms of visual connection (poor canopy height). However, the type of trees in the space is poorly chosen. The composition of the trees is particularly unsatisfactory in terms of tree species, canopy shape and colour. Overall, the A2 study area is non-compliant and the majority of the assessment is graded poorly meets and partially meets.

Conclusion

The results show that the different composition of woody plants in the monitored areas A1 and A2 differ not only from the visual point of view, but also from the functional point of view. The street space in Smolenice (A1) is significantly more efficient in terms of performing functions and at the same time it also performs an aesthetic-representative function better than the space in Dolná Krupa (A2). The significant predominance of deciduous tree species as well as the overall ratio between species in Smolenice (A1) results in better integration of public space into the green infrastructure system as well

as better connection with the cultural-historical value of the central part of the village with the urban concept. Last but not least, the size of the public space and its proportionality, which is better in the model seat Smolenice (A1), also affects the overall perception of the user. The area of the rated street is wider in the central part, where the development deviates slightly and from the main axis and thus creates a slight lenticular formation, reminiscent of a hanging area or the so-called Village square. The plan-genetic structure has a significant influence on the amount of greenery, the quality of greenery and the fulfillment of functions from the point of view of greenery, from which the assortment of tree composition, used cultivars, forms and varieties also derives. Improperly chosen composition as in the case of Dolná Krupá (A2) even under relatively suitable conditions will achieve a bad aesthetic impression (hard conifers in alley planting with deformed crowns) but also reduced safety and connectivity (poor crown placement, poor growth form and species song with shading).

References

Bechera, D., Kuczman, G. (2020). Hodnotenie drevín vo vybraných verejných priestorov vidieckych sídiel v nížinnom type krajiny: Evaluation of wood plants in selected public areas of rural settlements in the lowliness type of landscape. In *Manažérstvo životného prostredia*. Žilina : Strix, pp. 166-171. ISBN 978-80-973460-3-4.

Bechera, D., Kuczman, G. (2019). Rámcová metodika vhodnosti druhovej skladby drevín pre funkčné kategórie plôch zelene v podmienkach slovenského vidieka = Framework methodology of suitability of species and species composition for functional categories of green areas in Slovak rural conditions. In *METES 2019*. Žilina: STRIX, pp. 142-144. ISBN 978-80-89753-32-1 (brož.).

Bihuňová, M., Supuka, J., Tóth, A., Šinka, K., Kuczman, G. (2021). Urban green areas and woody plant composition: dwelling space quality factor in the Klokočina housing estate. In *Ekológia*. 40(1), pp. 80-90. ISSN 1335-342X.

Feriancová, Ľ., Kuczman, G., Tóth, A. (2012). Solution Approaches and Examples of Public Spaces in Villages. In *Životné prostredie*, 46(4), pp. 209 – 213.

Mareček, J. (2005). *Krajinářská architektura venkovských sídel*. ČZU: Prague, Czech republic, p. 362. ISBN 80-213-1324-2 (brož.).

Rózová, Z., Supuka, J., Klein, J., Jasenka, M., Tóth, A. & Štefl, L. (2020). Effect of Vegetation Structure on Urban Climate Mitigation. In *Acta Horticulturae et Regiotecturae*, 23(2) 60-65.

Rózová, Z., Tóth, A., Pástorová, A. (2021). The impact of vegetation quality and composition on recreational cultural ecosystem services. In *Public recreation and landscape protection - with man hand in hand!*. Brno: Mendel University, pp. 478-481. ISBN 978-80-7509-779-8.

Rózová, Z. (2001). An influence of the geographical position on vegetation structure in the settlements of rural type. In *Acta Horticulturae et Regiotecturae*, 4(2), pp. 39-43.

Tóth, A., Kuczman, G., Feriancová, Ľ. (2016). Species composition and diversity of non-forest woody vegetation along roads in the agricultural landscape. In *Lesnícky časopis*. 62(1), pp. 56-66. ISSN 0323-1046.

Acknowledgement

This paper is an outcome of the educational projects KEGA 003SPU-4/2020 ZEL:IN:KA - Integration of Green Infrastructure into Landscape Architecture. We would like to thank these projects for supporting our scientific, research and educational activities.

Souhrn

Liniový typ zeleně v sídlech je jedním z důležitých prvků zelené infrastruktury, který propojuje krajinné a centrální zóny sídel s plošnými formacemi zeleně. Uliční prostranství spolu se zelenými plochami a liniovými prvky zeleně tvoří součást sítě zeleně a mají mnoho důležitých funkcí. Článek prezentuje výsledky hodnocení vybraných venkovských sídel a jejich částí funkčních zón na úrovni uliční zeleně z hlediska kvality dřevinné skladby a funkční účinnosti s ohledem na funkce zeleně.

Contact

Ing. Denis Bechera
E-mail: becheradenis2@gmail.com

Open Access. This article is licensed under the terms of the Creative Commons Attribution 4.0 International License, CC-BY 4.0 (https://creativecommons.org/licenses/by/4.0/)