

Report: Review of the visiting the forest with kindergarten children: Forest Suitability

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Introduction

Urban forests increasingly benefit from careful management and planning. While they offer urban population numerous ecosystem services, they are also subject to various pressures. Among the ecosystem services provided by urban forests, climate ones with urban heat islands mitigations and cooling effect and social/cultural are the most prevalent. The latter encompassing the aesthetic, spiritual, educational, recreational, and tourist forest value. Studies on the benefits of urban green spaces, including urban forests, report positive effects on healthy living in urban areas. Moreover, not only larger enclosed green spaces, but also smaller, even individual roadside trees have an impact on our health. For decades, we have associated spending time in a natural environment with the physical, mental, and social well-being of people of all ages. There has been focus on the most vulnerable groups in society: the elderly, the sick, women, the poor and the socially disadvantaged, but recently the focus has shifted towards children.

Problem

To improve connection with human activity and nature. It needs to be clearly structured. This project aims to predict whether and how much a people will visit and improve the natural connection.

Materials and Methods

Using the Municipality of Ljubljana as an example, I constructed a simple GIS-based model of urban forest suitability for a visit with kindergarten groups of children. Ljubljana is the capital and the largest city of Slovenia (Figure 1), with 290,000 inhabitants. With its forest surfaces reaching 40% and other green infrastructure, it is one of the greenest European capitals. The criteria for the evaluation of forest suitability for a visit with kindergarten children were acquired based on the survey conducted among the teachers in the Slovenian public kindergartens.

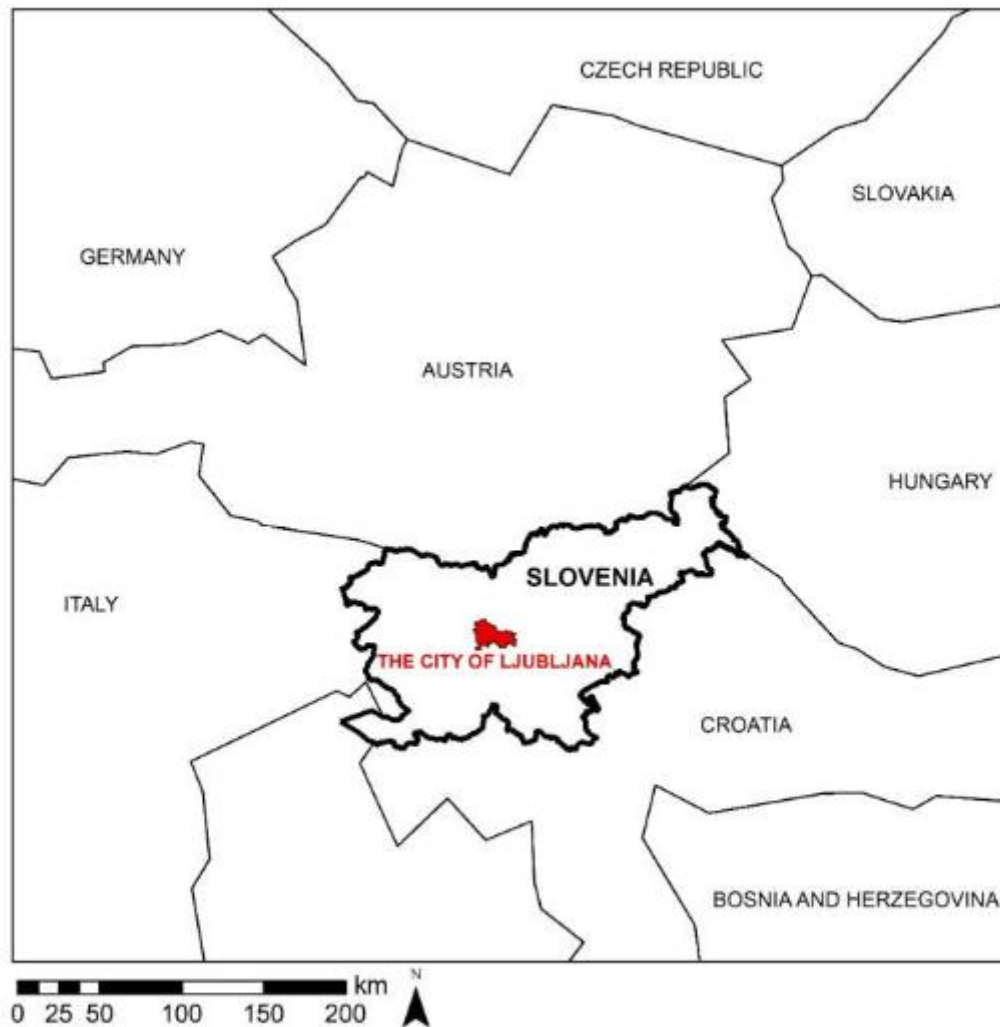


Figure 1. The location of Slovenia with the capital, The city of Ljubljana, in a broader context.

Data

The criteria for the construction of the forest suitability model were identified based on the results of the survey. For the forest suitability model, six spatial data I had access to were used. Due to modelling and standardization to a unified numerical scale from 1 to 5, the data were transformed into a raster image with a resolution of one meter (with the exception of the digital elevation model, the resolution of which was 12.5 m). For the preparation, modelling, and mapping of data, the ArcGIS Desktop 10.5 program was used (ESRI, Redlands, CA, USA). In order to determine the proximity of kindergartens to urban forests in the Municipality of Ljubljana, I used the address coordinates of all the public and private kindergartens in the municipal registry. The vector data on the proximity of water and meadows were gained from the Register of Existing Agricultural and Forest Land Use of the Ministry of Agriculture, Forestry and Food, while the vector data layer on the level of forest sections for different types and development stages of forests was provided by the Slovenia Forest Service. Forest type is divided into three categories: coniferous (containing more than 75% of coniferous trees), deciduous (containing more than 75% of deciduous trees) and mixed (the share of coniferous or deciduous trees does not exceed 75%). The data on the development stages of forests contain four categories: thicket, pole wood, timber, and regeneration stand. Since the photographs in

the survey correspond only to the first three categories, they are the only ones evaluated in the suitability model. The data on the terrain steepness were obtained from the digital surface model of Slovenia with the spatial resolution of 12.5 m.

Results

Table 1. The dependence of the frequency and duration of forest visits on the proximity of a forest to a kindergarten.

	Visit Duration	Visit Frequency
Kruskal-Wallis H	8.06	20.772
Degrees of freedom	3	3
Asymp. Sig.	0.32	0.000
Grouping Variable: the distance between a forest and a kindergarten.		

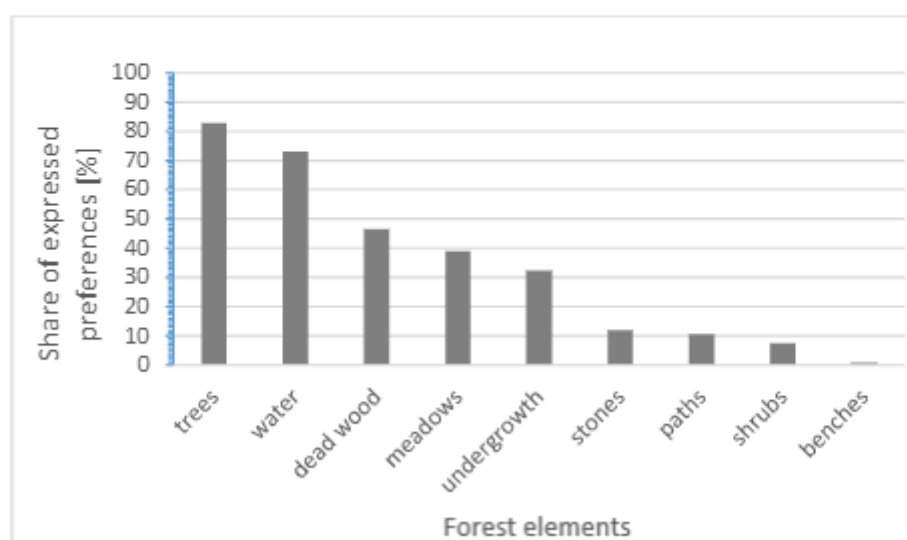


Figure 2. The availability preference for the chosen forest elements.

Table 2. Teachers' forest type preferences when visiting a forest with kindergarten groups.

Forest Type	Frequency	Percent	* Standardization on 1-5
deciduous	11	8.3	1
mixed	101	75.9	4
coniferous	21	15.8	1

* Standardization: 81–100%: 5; 61–80%: 4; 41–60%: 3; 21–40%: 2; 1–20%: 1.

Conclusion

Children spend a large portion of the day in kindergartens or similar pre-school institutions. Therefore, it is important these programs enable children to visit natural environments to obtain benefits by spending time there. By conducting a study of preferences among kindergarten teachers, I acquired criteria for the evaluation of urban forest suitability for a visit with kindergarten children. The results of the forest suitability model can be very helpful in urban forest and spatial planning. For long-term and sustainable changes in the accessibility and suitability of forests for visits by children (and other groups), it is necessary to plan at a strategic level. As the topic is transdisciplinary and covers both forestry and the

educational sector, cooperation at a higher administrative level (ministries) in formulating guidelines through the needs of educational institutions would be welcome. In urban areas, there is a great need for a high quality natural environment. Urban forest planning at city level should take into account the research results. The most suitable forest areas for visits with children should also be properly managed and maintained.