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MAGYAR AGRÁR- ÉS ÉLETTUDOMÁNYI EGYETEM

HOSPITAL GARDENS IN THE URBAN GREEN NETWORK,

BASED ON EXAMPLES FROM BUDAPEST

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The Doctoral School's

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1. BACKGROUND AND OBJECTIVES

Over the past decades, multidisciplinary research conducted in developed countries and published in prestigious journals has scientifically confirmed the basic principle of ancient Greek medicine, the health-protecting, health-preserving and -enhancing effects of green spaces. Most of the research has looked at the impact of green spaces on patients in hospital, and found that good quality green spaces help patients to heal faster and more effectively. However, the benefits of hospital gardens are not only for patients, but also for the citizens of the city, as they are part of the urban green system. This research is now guiding international hospital and hospital garden development.

However, the current situation in Hungary shows otherwise, and my objective was to map the current situation of Hungarian hospital gardens, to identify the positive effects they have on urban well-being and to identify the potential for improvement that these gardens can bring to the well-being of patients, staff, visitors and a new user group, the city residents.

The research will examine the role of hospital gardens in the urban green system from a complex set of perspectives: the conditioning role of urban hospital gardens, the assessment and quantification of climate change impacts, the expected and predicted impacts of green space development, and the access of urban residents to the recreational and aesthetic functions of hospital gardens that are currently closed or of limited use.

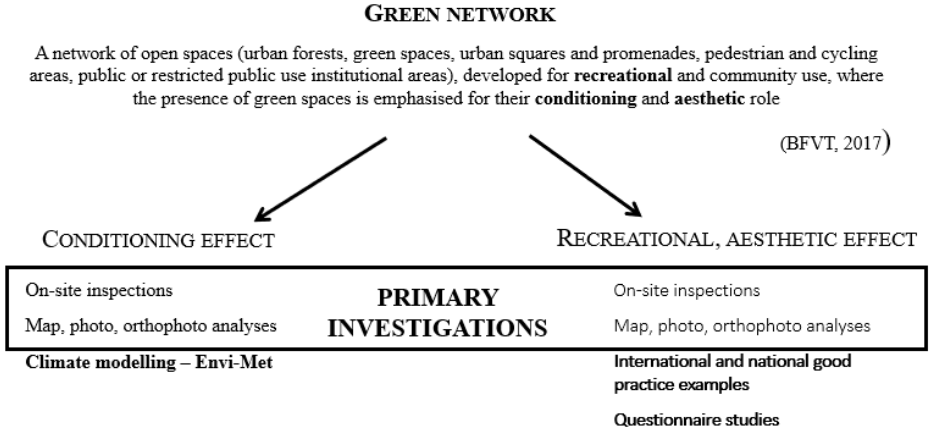
2. MATERIALS AND METHODS

I started the research by presenting the history, regulation, and design principles of hospital gardens, and then the significance of institutional gardens for urban planning, based on literature. Based on the literature, I selected 10 hospitals in Budapest whose gardens served as the basis for further detailed studies.

The research methods were selected based on the hospital garden as an element of the urban green network. I conducted primary research based on the definition of the green network, which helped me to explore both the recreational, aesthetic, and conditioning effects, and I further separated the research methods for the two roles:

- conditioning role: using ENVI-met modelling software

- recreational and aesthetic role: examples of good practice, questionnaire test



The primary investigation is primarily field work, on-site investigation, and secondarily the analysis of a visual, map database. After the field studies and site visits, I continued with a complex analysis of the facilities' endowments

(primary studies) using maps and orthophotos. Afterwards, I prepared a historical and developmental analysis for all 10 hospital gardens, which included an analysis and comparison of the literature and historical photographs and maps. For the two basic aspects of the analysis, I used three additional, independent research methods.

To investigate the role of conditioning, I chose ENVI-Met, as it is currently the most accepted climate modelling program, under constant development control, and can simulate near-real climate values, past, present, and future. No accurate climate measurements have been made for the study areas, so I could only look at the simulation values and compare how they have changed in previous years and decades, and what processes will take place. To investigate the conditioning functions of hospital gardens, due to the considerable time and energy requirements of the method, I further narrowed down the study material by taking 3+1 hospital gardens with different spatial structures from the hospitals already described as a sample.

To investigate the recreational role of the gardens, I complemented the research with an analysis of good practice examples and a questionnaire survey, considering the perspectives of all four potential user groups (patients, staff, visitors, and urban residents)

3. THESES, NEW SCIENTIFIC RESULTS

1. THESIS

Definition of the hospital garden: A hospital garden is an open space system on the property of a hospital (an inpatient specialised care facility with at least two specialties), which partly serves the functions of the facility (accessibility, internal transport and parking, storage, typically paved surfaces) and partly is a combination of recreational and conditioning green spaces for the well-being of patients, staff, visitors and even the urban population, and which also performs rehabilitation and healing functions in addition to active and passive recreational activities. The hospital garden is therefore a green space for limited public use, a landscape architectural work and a therapeutic and healing garden.

Based on a review of the historical, planning, and regulatory literature on hospital gardens (Chapter 2.3), I found that hospital gardens as institutional green spaces with specific functions are not defined in Hungarian legislation or guidelines. Hospital gardens are inherently limited-use green space facilities, which, due to the accelerated urban development in the 20th century, mostly appear as part of the urban tissue. The lack of urban recreational open spaces has led to an increase in the value of hospital gardens as a complex green infrastructure service, which calls for their opening up to the public as part of the urban green network rather than for limited use (Chapter 2.4).

2. THESIS

The internal spatial structure and land use pattern of the capital's hospital gardens is determined by ad-hoc developments, building designs and the increased demand for parking, after the initial conscious, patient-oriented planning, and the provision of internal surface parking, which

have caused fragmentation and mosaicism of the hospital gardens, a reduction in the recreational and therapeutic value and green space intensity, and ultimately a physical, ecological and visual degradation of the institutional gardens.

Based on historical studies (Chapter 2.2), I have found that the design of hospital gardens was influenced by conscious planning and development both internationally and domestically until the mid-20th century. Studies of the history of development and spatial structure in Budapest (Chapter 4.2) have shown that over the last 40 years, the demand for motorisation has led to the increasing use of internal car parks, which has resulted in an increase in paved surfaces and a reduction and fragmentation of green areas. In all cases, the reduction in the intensity of green spaces has led to a reduction in the utility and ecological value of gardens.

3. THESIS

The design and maintenance of the capital's hospital gardens have degraded the open spaces and garden functions that promote the recovery of patients, the recreation of doctors and other staff. The severe loss of value of hospital gardens has occurred at a time when international hospital design principles and practices are emphasising the role of gardens in healing and health promotion, and in strengthening the role of the urban green network.

Based on the field studies (chapter 4.1) -of the 37 typified Budapest hospital gardens, I have assessed 2 of the 5 types, each of which is more typical of the 5 types- I have found that today's hospital gardens have a poor functional garden offer, while the analysis of historical sources revealed sophisticated and varied garden spaces. Thus, in most hospital gardens, the functions of the hospital garden have now disappeared or have been degraded or reduced.

International literature research has shown that international developments are in contrast to what is happening in Hungarian hospital gardens in the 21st century. Since the 1980s, international research has focused on the role of green spaces in health maintenance and healing, and an analysis of contemporary examples of hospital architecture shows that these research findings are being considered in the construction and redevelopment of hospital gardens, at least at international level (Chapter 4.4).

4. THESIS

Up until the 20th century, the position of hospitals and hospital gardens in the urban fabric was dominated by the need for healing and the methods of treatment. Thus, by the end of the century, the institution of the hospital was mentally and physically isolated from the city, as the hospital garden was designed for patients, visitors and staff, while the population was not considered as a potential garden user. This spatial isolation, the complete separation of the healthy and the sick, is not justified from a public health or social point of view and is not conducive to recovery, according to recent research, while the partial opening of the hospital garden to the urban population may be beneficial for patients. Based on the historical overview (chapter 2.2), I found that the hospital and its garden were located outside the city in the early historical examples, and later inside the city, depending on the medical science of the period. The pavilion hospitals were built on the outskirts of the city, and the block hospitals that replaced them were built more within the urban tissue, while the tradition of earlier spatial isolation was maintained in the form of physical and a kind of mental barrier. Thus, the physical and social isolation of hospital gardens, which can no longer be justified from a professional point of view, is still a feature of the landscape. However, current research in the literature shows that patients' recovery is facilitated if they are not completely isolated

from everyday life (Chapter 4.4), and that modern medicine no longer requires patients to be completely isolated.

5. **THESIS**

For the design and dimensioning of hospital gardens, the normative proposals for the design of hospital gardens (e.g. garden area per bed, % of built-up area, functional requirements) formulated by Hungarian landscape architect theorists in the second half of the 20th century were typically taken into account in the design and implementation of new hospitals built in this period. For hospital extensions, these indicators could no longer be respected. Currently, there is no zoning standard, specific plot area, functional only % built-up is the only zoning standard for the design of hospital gardens.

During historical research (chapter 2.2.2), I discovered that the prominent representatives of the Hungarian landscape architecture profession, Imre Ormos and Imre Jámbor, were the most important architects of the 20th century. I have shown that the design of hospital gardens in the 19th century was based on normative professional recommendations (green space m2 per bed), and I have verified the adherence to these guidelines by measurements and area indicators in the realisation of contemporary hospital gardens. The current legislation supporting and regulating planning only specifies building percentages, and this is far from sufficient for today's professional hospital garden tasks.

6. **THESIS**

The historic hospitals, which are isolated in the urban tissue, have valuable and untapped green network potential. In the densely built-up inner city districts, opening up institutional gardens could be one way to improve the green network, given the established built-up and urban

tissue. By removing physical and mental barriers and creating new functions, the users of the hospital garden can be not only patients, visitors, and hospital staff, but also the urban population.

Through spatial and quantitative analysis of the Budapest hospitals at the urban tissue level (Chapter 3.1), I have demonstrated that the historic hospital gardens are part of the urban tissue of Budapest, and quantitative evidence shows that in some districts the potential green spaces that can be opened up (Chapter 3.1, Table 5) result in a substantial, measurable quantitative change in the amount of green space revealed to the community. The international and national examples presented in the good practice examples chapter demonstrate that urban populations can overcome their mental inhibitions and use green spaces if they are designed to support all four user groups and if each user group does not interfere with the other (Chapter 4.4).

7. THESIS

Based on the results of the microclimate research, the following conclusions can be drawn for green space developments in general: the biological activity of extensive and retrofit green roofs on existing buildings is overestimated in current Hungarian legislation, green roofs and roof gardens are mainly useful for water retention, visual and recreational purposes, but their local climate conditioning effect is negligible. Water surfaces (especially moving water surfaces, fountains, splash pads) are of considerable value in gardens, not only for their visual impact but also for their microclimate-improving effects.

Using ENVI-met analyses (Section 4.3), I have demonstrated that the air temperature reduction effect of extensive and retrofit green roofs is around 0.5 °C at the slab level (14 m, 21 m), which is no longer detectable at the garden level due to air convection. Moving water is analysed as having a noticeable

cooling effect. The reduction in air temperature can be as much as 6°C, and the reconstruction of the fountain will cause a significant reduction in temperature (0.3-1.35°C) and temperature sensation (4-14°C) not only at the garden ground level, but also vertically (up to 10-12 m above the water column, in this case 1 m, depending on air movement).

8. THESIS

The detailed prediction steps carried out with ENVI-met quantified and produced results consistent with previous observations that the largest thermal change is due to canopy growth, with little or no significant thermal change due to the replacement of inactive cover by single-level green cover (grass, ground cover) and no significant thermal change due to an increase in cover albedo. Moving water surfaces do produce a significant temperature change due to evaporation, but this is only noticeable over a small area.

Based on the results of the microclimate research, the following conclusion can be made for green space improvements in general: the greatest microclimate change in the garden can be achieved by increasing the woody vegetation (air temperature: 1.65-1.75 °C, temperature change: 21 °C), and a significant change can be achieved by increasing the green area (air temperature: 1.15-1.37 °C, temperature change: 20-21 °C), if this is combined with an increase in the canopy cover. When increasing the albedo of the pavement (asphalt 10, concrete 40) it leads only to a small microclimate change (air temperature: 0.16 - 0.48 °C, thermal change: 4 °C), similarly increasing the green area, if not accompanied by an increase in canopy cover (air temperature: 1.15-1.37 °C, thermal change: 1 °C). Although the presence of moving water can cause a significant climate change (air temperature: 4.03-4.08°C, temperature change: 3°C), it is not felt throughout the garden because of its punctuality (Section 4.4).

9. THESIS

The social importance of hospital gardens is clear; 90% of the urban population consider it important that a hospital is surrounded by a garden, and although a large proportion of them see the hospital garden as degraded and run-down, the experience of nature they have there is of value to them. Regardless of their role (worker, patient, visitor, city resident), the garden users recommend improvements to the hospital garden, to increase its recreational, walking, therapeutic and ornamental functions. For the urban population and current users of the hospital garden (patients, visitors, employees), if the hospital garden is structured in a conscious way, both current and future users are open and receptive to the introduction of new garden features and the partially limited public garden design.

Based on an online questionnaire survey of nearly 300 completed questionnaires (hospital staff 26%; patients 51.3%; visitors 56.6%; residents 13.5%), I confirmed the hypothesis that a quality hospital garden is needed by users and that by overcoming mental and physical barriers, the number of garden users can be increased. The most important functions are relaxation, walking, outdoor recreation and therapy, and there is a high demand for garden spaces, function, rehabilitation, and sophisticated design of gardens among users. The proposal to open the hospital gardens for public use was confirmed by the online questionnaire survey. More than two thirds of the respondents to the survey consider it realistic to integrate the hospital gardens into the urban tissue and to share at least part of the garden with the public (section 4.5). Sharing the costs of development and maintenance in the case of a limited or partial opening to public use could be beneficial for both the hospital and the municipality.

4. CONCLUSIONS AND RECOMMENDATIONS

1. Communicate the results of the research to other relevant professionals (doctors, hospital managers, architects, urban planners, urban designers, health authorities, municipalities) to raise awareness of the role of hospital gardens in the urban green network and the potential of hospital gardens. In the case of possible hospital and hospital garden developments, the research can help the investor, developer and planning profession.
2. Based on previous research - Imre Ormos, Imre Jámbor - as a continuation of the doctoral research, a new set of professional guidelines for hospital garden design could be prepared, since there is currently no legislation on the design of hospital gardens, nor is there a design aid or guideline in Hungary.
3. Further research would require further investigation of the issues of development financing and hospital management, since the cooperative arrangements (district, public, church - private) that can be considered in development can only become a practice if their financial, ecological, and social economic viability is well established.
4. The research has shown that Envi-Met, as an urban climate modelling tool, can be used at the garden scale. It can help designers to identify which interventions will have an impact on the garden to be designed, and it helps designers to use climate-sensitive landscape architecture tools, so it would be worthwhile to familiarise designers with the use of the programme.
5. The research can serve as a basis for a publication on healing gardens, a guide that can help hospital staff, architects, town and city planners, as well as landscape architects, to develop hospital gardens to serve their users effectively and to become true healing and therapeutic gardens for all four types of users.

6. It is proposed to continue the research with a more extensive study on the opening of other institutional gardens, which will help to systematically rethink the role of institutional gardens in the city, what role they can play in the development of the urban green network, whether and how they can improve the urban green space supply.

5. THE AUTHOR'S PUBLICATIONS RELATED TO THE TOPIC

JOURNALS (FULL PAPER)

ZAJACZ, V., SZILÁGYI, K. (2021): Ecosystem Services of Hospital Gardens - Based on Microclimate Analyses of Green and Blue Garden Elements. In: Acta Biologica Marisiensis, 4 60–72 pp.

ZAJACZ, V., SZILÁGYI, K., BAKAY, E. (2021): Kórházkertek tervezési elvei az ökoszisztéma-szolgáltatás tükrében - Design Principles of Hospital Gardens in the Light of Ecosystem Services. In: 4D Journal. (59) 18–39 pp.

CONFERENCE FULL PAPERS

ZAJACZ, V., SZILÁGYI, K. (2019): Kórházkertek ökoszisztéma szolgáltatása - különös tekintettel a településökológiai és zöldhálózati adottságok javítására. In: VIII. Magyar Tájökológia Konferenciakiadvány. Kisvárda. 349–355 pp.

ZAJACZ, V. (2020): A kórházkertek funkcióváltozásának elemzése budapesti kórházkertek példáján. In: Ifjú Tehetségek Találkozója. Budapest: Szent István University. 383-401 pp.

ZAJACZ, V., PAP, M., ALMÁSI, B. (2021): Hospital Gardens as Green Havens. In: Stop and Think Book of abstract. Uppsala: Swedish University of Agricultural Sciences. 103 pp.

ZAJACZ, V., PAP, M., ALMÁSI, B. (2022): Budapesti kórházkertek ökoszisztéma szolgáltatásának In: A Lippay János – Ormos Imre – Vas Károly Tudományos Ülésszak tanulmányai. Budapest: MATE Budai Campus. 654-668 pp.

OTHER RELATED WORKS

Coevolvers project - Hungarian Living Lab - Healing Garden Advisory Board Membership (January 2024)

Therapeutic Horticulture (TH) Training- Hortus Medicus Training instructor (2024)

THESES SUPERVISOR RELATED TO THE TOPIC

Major Imola: A Borsod-Abaúj-Zemplén Megyei Központi Kórház ÉS Egyetemi Oktató Kórház Szabadtereinek Megújítása – A Velkey László Gyerekegészségügyi Központ Szabadtérépítészeti Terve (2018)

Varga Liza: Szent János Kórház Szabadtér-építészeti koncepcióterve és részterületének kertépítészeti terve (2020)

Bihari Fanni Zsófia: Mozgásszervi rehabilitációs kert- A Szolnoki MÁV Kórház és Rendelőintézet mintáján (2020)

XXXV. Országos Tudományi Diákköri Konferencia Agrártudományi Szekció 2021.: Bihari Fanni Zsófia: Mozgásszervi rehabilitációs kertek tájépítészeti vonatkozásai II. helyezett (2021)

Novák Vivien: Országos Orvosi Rehabilitációs Intézet Szabadtérépítészeti Megújítása (2022)

Varga Erzsébet: Idősotthonok kertjének kialakítási lehetőségei (2024)

Koncz Bianka Amaril: Visegrádi Szent Kozma és Damján Rehabilitációs Szakkórház és Gyógyfürdő kertépítészeti megújítása (2024)