

**PHD DISSERTATION
THESES**

GABRIELLA SZASZÁK
BUDAPEST
2018



SZENT ISTVÁN UNIVERSITY

UNIVERSAL OPEN SPACE DESIGN

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INTRODUCTION

In contemporary landscape architecture barrier-free, inclusive design is a hot topic, because it is in a strong need for better solutions. The primary goal of my research was to interpret and analyze the theoretical and technical background of Universal Open Space Design (UOSD). The analysis, evaluation and synthesis were based on a comprehensive literature review; case studies from my landscape architectural and rehabilitation engineering practice; on-site and follow-up interviews, consultations and observations with people living with disabilities; and site visits in several European countries. The aims of my research were to specify the concept and the Hungarian nomenclature of UOSD; to assess the needs of people living with disabilities concerning open spaces; to evaluate the operative Hungarian legal texts with spatial consequences, and adapt them to open spaces; to examine whether and how the function-focused, purely practical and non-traditional canon of barrier-free design can be integrated into the contemporary, conceptual, aesthetic-based paradigms; and to investigate the compatibility of the needs of inclusive human access and the interests of nature conservation concerning semi-natural landscapes.

Results were derived from the critical evaluation of the theoretical and technical basis as well as of the Hungarian laws prescribing equal access to the built environment; and from the standardization of open spaces typified by their tolerance towards physical interventions. I stated that creating equally accessible open spaces for all by following the UOSD method can contribute to the social inclusion of a remarkable minority consisting of people living with disabilities together with the people who are affected by disability issues through their personal relations. The importance of creating equal access to open spaces is also confirmed by urbanization, which – by the increasing proportion of people living in cities – increases the need for urban green areas and also the number of inhabitants who require accessible solutions for the equal social participation. The aging society also leads to similar demands towards the built environment.

In Hungary there is an explicit asymmetry concerning different disabilities and also the technical background of the various scales of spatial design: guidelines for compensating mobility impairments and accessibility requirements for buildings are more detailed. People with visual impairments suffer social disadvantage also because of the dominance of visuality rooted in culture. The ignorance of society and the lack of empathy can be traced back to the fact, that the perception with visual impairment cannot be experienced directly for those with abled vision, but only through the reports of affected agents – so the understanding of their spatial experience is indirect and limited. Therefore in this research an emphasis was given to the special perception and the different spatial needs of visually impaired people.

Concerning accessibility requirements, the approach of the Hungarian legislation controlling the built environment is strongly architectural-focused, and – without adaptation – its deductive regulation is hardly applicable to open spaces, where natural components, limited to modification, are dominant. Being forced to apply such inadequate rules often leads to over- or under-regulation, which causes equal access provided only at a minimum level prescribed by law, obstructs creative inclusive design, and greatly worsens the social reception of barrier-free, inclusive design solutions

and disability itself. At the same time it can be stated that the minimum-requirements for barrier-free open space design cannot be generally specified.

On the other hand, general and special needs and preferences towards open spaces overlap to a large extent, so the contemporary city and park usage patterns foster equal access for all. The findings of this research also show that in semi-natural landscapes the most effective tools of UOSD – also supporting nature conservation and maintenance – are the design of ecologically and inclusively sensitive spatial compositions and the use of info-communication provided by digital technologies. The practical applications of research findings are immediately and directly available for practice, and the topic is worth further research in several directions, contributing to the spatial and social inclusion for all.

OBJECTIVES

- specify the concept and the Hungarian nomenclature of Universal Open Space Design
- assess the needs of people living with disabilities concerning open spaces, and specifying their components affecting equal access via the related literature, the report of affected agents, and my own professional and personal experiences
- evaluate the effects of the operative Hungarian legislation with spatial consequences on the spatial inclusion and on the creative design process, and their adaptability to open spaces
- examine whether and how the function-focused, purely practical and non-traditional canon of barrier-free design can be integrated into the contemporary, conceptual, aesthetic-based paradigms
- observe whether and how general and special needs and preferences towards open spaces overlap, and specifying general design principles also contributing to inclusive landscape design
- investigate the compatibility of the needs of inclusive human access and the interests of nature conservation concerning semi-natural landscapes.
- observe info-communication accessibility's potential in open space design towards enhance equal access and help the orientation of all agents

RESEARCH METHODOLOGY

The basis of this research was the postgraduate course on rehabilitation engineering at the Budapest University of Technology and Economics, where psychological, sociologic, ergonomic, physiologic, anatomic, special educative and technical etc. aspects of disability were observed. In 2009 I joined the Accessibility Working group of the Hungarian Association of Blind and Partially sighted (MVGYOSZ), which is a mailing group discussing about accessibility issues. This group is potent in handling this subject on a very complex and constructive way, involving many disciplines (e.g. rehabilitation engineering, architecture, technical sciences, special education, sociology, legislation), and many people living with different visual impairments. Having the opportunity to follow and participate in these discussions, questions and answers regarding landscape architecture were selected and showed in this research. Ensuring the participation of people living with disabilities in the design process via continuous consultations is essential, as they are the only reliable source about their perception, which informs design about the directions and tools that should be used – especially in the case of sensory impairments. The landscape architectural and rehabilitation engineering design practice also kept my scientific and practical knowledge up-to-date.

The theoretical background of this research is based on literature review in the fields of rehabilitation engineering, landscape architecture and other related specialties like technical sciences, psychology, sociology and special education. The legal context got greater attention as its requirements get manifested in the built environment. On the basis of the reviewed sources I specified the context and the main concepts of Universal Open Space Design. I also studied publications on inclusive open spaces, and evaluated their methods' applicability or adaptability to Hungarian open spaces. By the analysis, assessment and synthesis through the comprehensive literature review, the recent status of equal access to open spaces in Hungary and the possible directions of development have been explored.

The research was confirmed by field trips and case studies in areas where inclusive landscape design methods were used, or were planned to be used during the design process. A certain site was visited several times when possible to be able to monitor the project and define the future directions of UOSD. During the site observations, continuous consultations with designers, green infrastructure managers and people living with disabilities were carried out. The preliminary suggestions and follow-up reports of concerned agents were recorded via informal discussions, mainly taking place on the mailing list of the Accessibility Working Group of MVGYOSZ. The experiences informed the theoretical background, and mistakes were corrected when possible.

Via the analysis and assessment of literature, on-site and follow-up interviews, site visits and case studies basic characteristics of open spaces regarding inclusive, equal access were specified and open spaces were typified into three categories. For the demonstration of these open space types three case studies were presented, in which I participated as a practicing landscape architect and rehabilitation engineer as well as a researcher. Based on the theoretical and practical research I identified the methods and tools of UOSP which can be used to enhance equal access to open spaces by the adaption of the well-known concept of Universal Design to the landscape. The findings have been used during both the practice and the research for developing and updating UOSD methods which were then applied in following projects.

FINDINGS

NEW SCIENTIFIC FINDINGS

THESIS 1 I stated that the Hungarian translation of the concept of Universal Open Space Design – originated from the wide-known concept of Universal Design – is appropriate to specify the landscape design strategy related to spatial inclusion, as well as the translated terms of Inclusive Open Space Design and inclusive open space. These concepts were used only in other fields of spatial design, therefore defining the nomenclature was of strong interest.

In Hungary equality of opportunities is a relatively new concept, especially in relation to open spaces. The inaccurate or outdated nomenclature is not capable of handling the new challenges. The international concepts of Universal Design (UD), Design for All (DfA), Inclusive Design were translated into Hungarian, and in spatial design two of them took root: the term of Inclusive Design is used among interior designers and ergonomists, and UD by architects. The goals and tools of the mentioned strategies are very similar, and their spread in a certain country is not dependent on the exact content and structure of them, but the main theoretical conception what matters. But the easily translatable and therefore current term of UD has a product-based approach, which makes its understanding complicated concerning open spaces. The conception of Inclusive Design is more identical with the Hungarian attitude, and is widely applied to the outdoor environment in several European countries, but the term is not used in Hungary in relation with open spaces. In conclusion, UD is more practical to use in the discussion about the topic. It also has to be noted that I use the term of open space for every outdoor spaces – including open and semi-natural landscapes –, as it is strongly associated with urban context, and through this association it refers to the social context as well – and that is basic when dealing with disability and equality issues.

THESIS 2 I stated that barriers in the built environment are often the manifestations of the ignorant and exclusive social attitude, and in the resolving of the conflicts originated in this phenomenon is essential the individual social responsibility – which in the case of spatial designers means both human and professional responsibility. I also pointed out that in Hungary equal access to the built environment is provided only at a minimum level prescribed by laws.

The research showed that social context is basic in spatial inclusion. In Hungary solidarity originated from social and cultural values is poor, and therefore dogmatic-deductive legislation has to control the requirements for design and construction. This leads to over- and under-regulation, forcing designers to apply general and inflexible rules to situations that need interdisciplinary, inductive, special and sensitive solutions. This phenomenon has a negative effect on the social reception of barrier-free design and disability itself, too. The application of the inductive approach is also obstructed by the new, strongly functional forms of barrier-free design, which are hard to integrate into the aesthetic-based contemporary paradigms, and therefore it tends to be hidden. In addition, guidelines for UOSD are at an early stage of development, and – together with the ignorance toward disabilities and the inadequate legal context related to it – the application of general requirements often leads to functionally and aesthetically doubtful results.

THESIS 3 I deduced, that fulfilling the needs of people with visual and mobility impairments when designing inclusive open spaces, they will be equally accessible for other people with or without disabilities, too. This means that designing for visual and motor impairments cover all the needs of different disability groups concerning the outdoor environment, and results in equally accessible, barrier-free, inclusive open spaces for all.

These findings are derived from the analysis and evaluation of the special needs and preferences of people living with different disabilities, based on several reports and suggestions by them. The results show that the main barrier for visually impaired people is the disappearance of curbs, which at the same time is essential for people using wheelchair to be able to drive independently, safely and conveniently. Visually impaired walkers need tactile and visual contrasting warning and guiding surfaces to be able to detect these small differences in level – and these tactile surfaces are potential barriers for others because of the increased chance of tripping or falling, and for wheelers because of the more intensive vibration while driving through these uneven surfaces. Furthermore I deduced that open spaces designed following UOSD's principles are more accessible, safe and convenient for all users.

THESIS 4 I stated that the legal and technical requirements of UD in Hungary are architecture-oriented, and principles regarding open spaces are strongly deficient. At the same time, open spaces are concerned as part of the built environment, and therefore regulation for buildings has to be applied in the outdoor environment, too. But open spaces – characterized by natural components and features which are hard or impossible to be modified – are incapable of accept these rules without adaptation.

In Hungary there is a pronounced and causeless asymmetry for architecture at landscape architecture's expense both in the development of design guidelines and requirements just as in prestige. Open spaces as part of the built environment have to meet the requirements for buildings, whose application is often impossible because of the presence of the limitedly modifiable natural components and features. This phenomenon is more intensive in the generally neglected area of UD. In Hungary, laws controlling construction refers to open spaces at a small extent (28,1%), although 69,5% of the exclusively architecture-focused requirements also have consequences in the outdoor environment. Furthermore, in the primary document summarizing all the principles for UD in Hungary only 23,1% of the requirements and recommendations refer to open spaces, although the 61,2% of the architectural guidelines concerns them.

THESIS 5 Based on the analyzed case studies I stated that the average and special contemporary needs and preferences towards open spaces overlap to a large extent, so the general contemporary city and park usage patterns foster equal access for all.

These needs are proper infrastructure (for example good quality walking surfaces and appropriate number of public toilets), transparency, legibility, natural atmosphere, public access and the use of digital technologies. Based on the analysis and assessment of the Hungarian regulation I pointed out that equal access is provided for people living with disabilities by the fulfillment of half the criteria (50,1%) regarding general access and safety. In semi-natural landscapes characterized by natural conditions – where the possibilities for physical intervention are limited – 97,4% of general design principles enhance inclusive access for all.

THESIS 6 I specified the concept of the contrast-effect, which is a design tool of UOSD supporting info-communication. I pointed out certain fields of interest that lack knowledge regarding contrast effect in open spaces, which is crucial to develop the theoretical background of UOSD.

The theoretical background of info-communicational accessibility and the concept of tactile, visual and acoustic contrast effect is poorly researched and developed, although it is capable to help the mobility and orientation of all. At the same time it influences the appearance and identity of a certain site, too. Thus underdevelopment results in differing solutions even within a certain country, often leading to functionally and aesthetically discommended technical solutions. As a result I translated international terms and created a new concept regarding the contrast effect.

THESIS 7 I stated that open spaces' tolerance towards physical interventions is strongly influenced by the proportion of their natural and artificial components, and after this criterion three types of open spaces can be specified: (1) urban, mainly paved open spaces (2) urban, public green spaces and (3) semi-natural landscapes.

More details to these categories can be added reflecting on urban characteristics, protection interests of natural values or monuments, thematic concepts or other aspect of landscape architecture.

(1) The primary function of **urban, mainly paved open spaces** (streets and squares, environs of buildings) is mobility and transport via connecting buildings and creating the walking network of the city. As they are strongly modified and artificial components are dominant in them, regulation concerning equal access to the built environment is valid to the largest extent in this category among the three specified open space types – especially in the environs of public buildings.

(2) **Urban, public green spaces** (public parks, institution gardens, thematic urban open spaces) are biologically active areas for potential recreational activities, with important physiological and psychological effects on the city and its inhabitants. The natural atmosphere is immanent here, and therefore physical interventions aiming accessibility must be applied very carefully. At the same time, around the buildings and intensive parts a higher level of accessibility can be required. Defining the hierarchy between units and connections after their different tolerance towards accessibility interventions can contribute to realizing spatial inclusion.

(3) **Semi-natural landscapes** (including urban woodlands and waterfronts) are public areas dominantly characterized by natural elements and features. Like urban green spaces, they are biologically active areas, can host recreational activities, and are important for humans both from physiological and psychological aspects. This type has the lowest tolerance towards physical interventions for providing human access, and often their components and features cannot be modified, which can obstruct the application of UOSD.

THESIS 8 I stated, that minimum-requirements for inclusive access cannot be specified for open spaces. Instead, following the principles of spatial inclusion and reasonable accommodation and include people living with disabilities in the design process, an individual UOSD program has to be formulated with detailed description concerning the exact method applied and UOSD tools used.

In Hungary there are minimum-requirements concerning buildings, which means that no release from their obligations can be obtained: public buildings have to be accessed from the parking place, and an accessible entrance, toilet and route between these two have to be provided where the public service is available. But, as I earlier stated, natural components of open spaces are limited to modification. In addition, natural components and features are the public service themselves, providing the opportunity for recreation and other activities – therefore the public services often cannot be fully accessed. Furthermore, the certain units are also hard to define, where the public services of that certain open space must be inclusively accessed.

THESIS 9 I proved that UOSD combined with ecologically sensitive design is capable to support spatial inclusion and the interests of nature conservation at the same time. In semi-natural landscapes the most effective tools of UOSD – also supporting nature conservation and maintenance – are the design of ecologically and inclusively sensitive spatial compositions and the use of info-communication provided by digital technologies.

Based on the site visits and case studies, and also on the assessment of the reports of people living with disabilities concerning their needs and preferences towards open spaces it can be pointed out that the third type of open spaces with the lowest tolerance for physical interventions, namely the semi-natural landscapes often are subjects of nature conservation, and therefore human access is physically and also theoretically limited. Human presence without defined frames can lead to the degradation of natural values, and with the decrease of naturalness, nature experience is also degraded. By analyzing the design principles after several criteria, I deduced that ecologically sensitive UOSD is capable to support inclusive access and nature conservation at the same time.

NEW PRACTICAL FINDINGS

FINDING 1 Nature experience is originated in the natural atmosphere of the outdoor environment, and is essential for physical and mental health and well-being. Spatial experience is determined by the perception of open spaces, and is basic to the specification of the design methods to be applied to a certain site. The specified concept of **landscape experience** integrates these two fundamental concepts.

FINDING 2 I stated that **contrast effect** is capable of helping human orientation in space, including people with and without disabilities, and is especially helpful for people with changed or originally non-average perception because of a presence of a disability. At the same time contrast effect is often neglected by designers as it is markedly visible. For the more effective usage of this design tool further research is needed.

FINDING 3 I translated the terms of Tactile Walking (Ground) Surface Indicators (**TWSI**, TGSI) and Contrasting Walking Surface Materials (**CWSM**) to Hungarian. As opposite to **artificial guiding and warning surfaces**, I also defined **natural guiding and warning surfaces**, which concept is strongly related to CWSM. The **use of CWSM for warning** is recommended for consideration, and is worth further research.

FINDING 4 The **relation between tactile and visual contrast** has to be explained. In the case of TWSIs, they are simultaneously required in the same surface. Other guidelines allow their separation, while ensuring that both of them are present. The aesthetical problems occurring need further research. What is the proportion of information coming from different sensations at the same time? Do simultaneous contrasts within a certain surface influence sensation and perception, or can different contrast effects (tactile, visual, acoustic) be separated without causing information loss? It would be useful for designers to **define contrasting pavement types** that could be used in UOSD.

FINDING 5 The detectability of **artificial tactile warning surface when directly or indirectly** (after step's length break) **accessed** from artificial tactile guiding surface needs further investigation.

FINDING 6 The defined concept of UOSD is illustrated with a **photo appendix** containing 846 photos and figures from 15 different countries.

FINDING 7 After analyzing and assessing the **Hungarian legal regulation** on the built environment, I made proposals for its **refinement or modification** to resolve the internal contradictions, and making them adaptable for open spaces.

- refine the concept of function regarding open spaces
- define ramp
- refine gradients needed by people using wheelchair; assign maximum differences in level to the certain gradients
- define the cross-fall and the overall fall of horizontal, level surfaces that permit drainage of surface water

- define horizontal/level surface for accessibility (in international standards it is max. 1:50)
- define horizontal/level surface for accessibility on ramp landings, where drainage of surface water and prevention of rolling down are of high importance
- assign radiuses to gradients in the case of curved ramps (sloped paths) for accessibility
- refine requirements for using fences near stairs and ramps in open spaces
- refine handrail requirements for accessibility (height of the rails should be 75 cm and 95 cm)
- put further research on the **characteristics of pavement surfaces** regarding vibration exposure of wheelchair users (gap's width and depth between pavers, chamfer, laying pattern)
- refine recommendations regarding benches and drinking fountains
- refine requirements for planting design with defining plant species that are non-allergenic and therefore should be preferred in public urban environments

CONCLUSIONS AND IMPLICATIONS OF THE RESEARCH

PRACTICAL APPLICATIONS OF RESEARCH FINDINGS

- supplement regulations on the built environment concerning the interests of open space design, especially regarding the recommendations that are essential but not obligatory (eliminate under-regulation) – and at the same time remove inadequate requirements that block fruitful UOSD (eliminate over-regulation) (both process needs a drastic shift in the Hungarian social attitude towards disability – social inclusion is strongly needed)
 - design: obvious, inclusively sensitive, contextual, well-applicable requirements
 - construction: obligatory requirements, that cannot be neglected or modified
 - authorities: obvious requirements to communicate and control
 - rehabilitation: teachable solutions also helping mobility and orientation training
 - disability advocacy associations: stable reference basis
 - higher education: enhance sensitivity of designers, strengthen social awareness
 - information propagation: stable social basis
- spread UOSD principles, increase social awareness in designers, develop the background of inclusion

DIRECTIONS FOR FUTURE RESEARCH

- generally it can be stated that the topic needs and is worth further research, which is of high importance in order to integrate the needs of visually impaired people into UOSD, and to foster social inclusion through both aesthetic and well-functioning design solutions
- research social, economic, philosophical background of equal opportunities
- refine definitions in Hungarian legislation regarding the built environment, and add concepts related to UOSD that are missing from the recent regulations
- observe perception and spatial experience of people living with disabilities
- observe preferences in mobility and orientation among people living with visual impairments in Hungary
- explore sensation via the different senses and observe the proportions of spatial information coming via the different senses in the presence of different disabilities; discover the role and importance of simultaneous stimulation
- review paradigms in contemporary landscape architecture and identify their concepts that are capable of supporting inclusive access to open spaces; document and present the exact elements and features that help orientation
- make questionnaires about whether and how the integration UOSD solutions to the contemporary aesthetic canons is possible
- add more examples to the inspirational photo appendix to help designers with creative ideas related to UOSD

- develop UOSD method by adding missing principles and refining existing ones
- natural guiding surfaces and landmarks helping orientation are secondary subjects in research, often having accidental conjectures – the topic needs specific, deeper research to inform the theoretical and practical basis of UOSD
- within the frames of the former research specify design guidelines concerning contrasting pavements used outdoors to benefit designers and spatial inclusion (define the contrast by percentage is not informative enough in open spaces where lighting conditions differ to a large extent – specification of concrete, paired contrasting materials is needed)
- specify plant species by their pollen characteristics to be able to design inclusive planting (viz. to avoid plants causing strong allergies in public open spaces as far as possible)
- start discussion between landscape architects, special educators and rehabilitation engineers to learn basic principles of UOSD and general landscape design, to understand the needs and abilities of people living with disabilities, and to combine this knowledge by the use of each other findings for creating more inclusive open spaces (e.g. inform UOSD theoretical and practical background, help mobility and orientation training and its application for everyday life)

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