

## **THE METHODOLOGY FOR EVALUATING ACCESSIBILITY AS A TOOL FOR INCREASING SOCIAL RESPONSIVENESS OF URBAN LANDSCAPES IN SINGAPORE**

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**Abstract.** Accessibility of public environment make immense impact on active participation of all citizens in different spheres of public life. Quality of access to urban landscapes and buildings for all citizens gains especial importance in the context of recent demographic trends in the developed countries, as ageing communities, decreasing birth rates and continuing urbanisation of natural environment. Creation of a more responsive urban environment is the instrument to facilitate social integration of people into active public life, especially for the ones with limited physical abilities, instead of sheltering them from a society by extending social services. The author presents a research-based methodology for analysing and evaluating accessibility in public areas of a big city. The originality of the method lays in empowering the disabled persons to play the active role of experts in measuring and evaluating accessibility according the developed assessment tool. The used methodology allows evaluating accessibility on different urban scales: in urban landscapes, in buildings, and in their interiors. The presented case study performed in Singapore explores the quality of access that people have to public spaces, metro stations, hotels and café. As a result, the author presents recommendations for improving accessibility in the city by improving the quality of urban environment and architectural design of buildings, updating the building regulations, as well as construction and maintenances of open spaces and buildings. The results of this research provide the comprehensive action plan for eliminating barriers in the specific Singapore's environment and in the other cities. Conclusions present the model of coherent accessibility monitoring tool and improvement programme that facilitates creation of a socially responsive urban environment.

**Keywords:** evaluating accessibility, public environment, landscape, sustainability, building regulation, disability

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## INTRODUCTION

Citizens of modern societies have different opportunities to exercise their rights for participating in public life that are frequently obstructed and limited by different barriers to access public and residential environment, buildings and services. The aspect of equal accessibility to urban environment becomes especially important in the face of recent demographic shifts in developed countries as the share of ageing citizen increases while the birth rates plunge, and environmentally sensitive groups of citizens comprise bigger and bigger part of population. Different social care concepts were tested around the world for planning and running care for the disadvantaged and the weaker citizens in historic run: isolation and negligence, exclusion to disconnected institutional care facilities with excessive daily care services, massive care and services, and some others. Psychological, functional and economic drawbacks of these models became evident and led to development of the inclusive concept based on social integration of people with limited physical abilities. Integration and involvement of the weaker citizens into active social life rather than sheltering them from a society by excessive social services is the basic concept and the dominating policy principle in the developed countries around the world. Following this concept quality of access for people with disabilities, the elderly, the sick and the other sensitive groups of citizens to all areas of urban environment becomes especially important issue. The article is examining the trends of accessibility in Singapore and is focusing on measuring and evaluating qualitative and quantitative aspects of urban accessibility based on the case study in Singapore.

### **Programming and Measuring Urban Accessibility**

Quality of access to built environment is estimated in planning, design, construction and maintenance of urban spaces, buildings and facilities. For this reason, the accessibility requirements of different building codes and standards, regulations and guidelines as well as design and construction practices of different countries are important. Better accessibility in public, residential and labour sectors could be achieved by precisely following requirements of building code as well as integrating good practices and research based solutions into planning and design process. This leads towards more safe, sustainable, functional and welcoming urban and rural environment with specific climatic, cultural and social tradition.

Multiple practices have been developed in different countries to achieve higher levels of accessibility. As a complex issue, good accessibility requires complex solutions in planning, design, technical condition and management of public spaces, buildings, mobility and transport systems, and other. Common practices include survey of access to residential, authority, health care services and facilities [Davidsson and Sodergard 2016]. Education institutions are usually outlined to be of the utmost importance for the disabled, and therefore they should be designed and built with attention and care for the needs of students with limited mobility and other impairment [Chard and Couch 1998]. More rarely, some research focuses on transport and infrastructure facilities, as metro stations and their environment [Sun et al. 2016]. In these works the importance of mobility infrastructure is emphasised as it links different city

areas and facilities. While the role of accessible mobility is discussed, the connections to city centre are especially underlined, as most of services, points of interest and leisure usually are there in abundance, and this attracts people to commute there more actively [Gant 1997].

In the era of intensive information and communication technologies, research covers this field as well: De Ipina presents the method where Virtual Reality (VR) solutions are used to facilitate employment of people with disabilities [De Ipina et al. 2007]. This is a strong tool looking for the future applications of reality assessment: in complicated cases, VR could automate the assessment process as guided by the code requirements or by the good practices.

Experience of many European cities has proved that developing and adopting a well-coordinated accessibility programme is the best way to approach the multiple issues of urban transport and mobility, landscape and recreation, housing and public space (Fig. 1). As positive public perception of disability is essential for gaining successful results, the aim of accessibility programme is also to raise public awareness of basic human needs and increase understanding of how to implement access requirements in a feasible way.

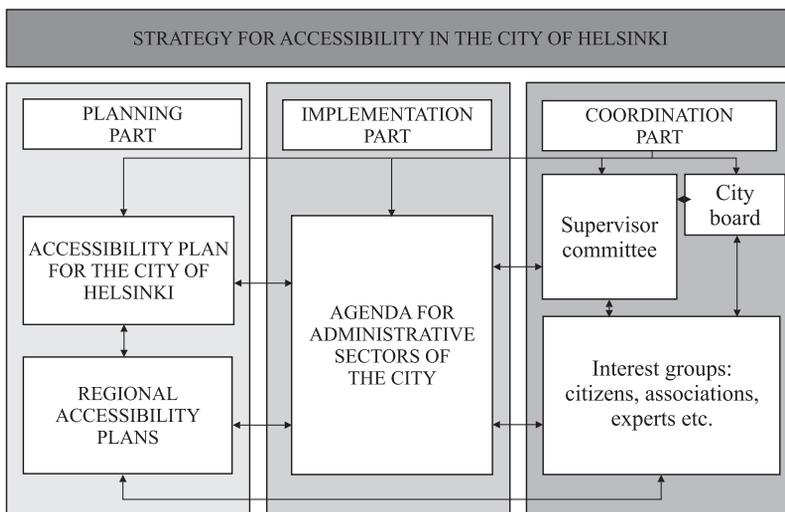


Fig. 1. Accessible Helsinki 2001–2010 programme planning chart

Achieving better accessibility is a process in a timeline therefore the priority list of measures is important. Ten priority areas were outlined by the coordinators of the accessibility programme “Accessible Stockholm 1999–2010 Plan” for immediate intervention among many activity lines for safer and more comfortable city [European Committee... 2010] (Fig. 2, 3).

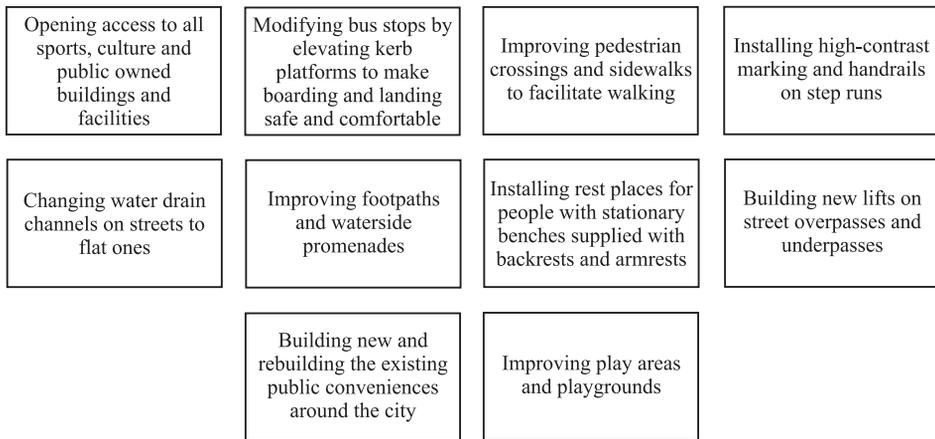


Fig. 2. Key measures implemented in accessibility programme Stockholm – 2012 [Klaesson 2008]



Fig. 3. Improving quality of pedestrian areas and adding rest places was a priority measure for implementing accessibility plan in Stockholm, Sweden

### Research, codes and architectural practices for accessibility

Different methods and tools are used to assess and evaluate accessibility worldwide. Assessment often draws comparison of the status quo situation against the code requirements, launches questionnaires to the users and city planners, also international tools,

e. g. the UN Guidelines are used [Evcil 2010]. Still, criticism on using standard-based audit tools and off-site interviews exist [Friedner and Osborne 2013]. Involvement of the direct users – people with the different type of disability in audits is still rear. Some research involved one person with random type of disability into the survey [Lewis, McQuade and Thomas 2005]. As the segment of the city life, mobility sector is widely involved into access survey practices [Friedner and Osborne 2013]. International and regional conferences on disability assessment tools and methods is another important point of sharing knowhow on making mobility systems accessible to people with diverse abilities and travel skills [Baris and Uslu 2009].

Investigators also take into account the aspect of light on streets and inside the buildings while evaluating access. Importance of good light in public areas ensures safety, comfort and pleasure of being out in the city while individual features of light perception should be taken into account. Researchers use inputs from biophysical research and analyse developing for circadian stimulus as a metrics for quantifying light in internal spaces of buildings. This aspect deserves attention while developing criteria for assessing access quality inside the buildings [Rea and Figueiro 2016]. More and more attention in assessing accessibility is given to access to the surrounding landscapes that have the potential multiple positive effects on a person from a traditional recreation, social communication in a public space and healing effects of therapeutic gardens and other green spaces [Pudelska et al. 2016]. Sensory gardens are especially effective for the public and private use of the sight-impaired people.

As accessibility is an important part of universal design strategy and practice, researchers suggest that access could be evaluated mainly in that context [Meshur 2016]. Accessibility is an important part of sustainable building of eco homes and eco communities, while assessment of legislation, barriers and mobility is recommended as the most efficient way to discover the degree of accessibility [Bhakta and Pickerill 2016].

While designing the scope of assessment most frequently wheelchair-bound, sight-impaired and mobility-impaired persons are covered [Baris and Uslu 2009]. This list does not take into consideration all types and sorts of disability that people might have, and therefore it has to be extended.

Regulations and codes for accessible environment are used in the most of developed countries around the world. The European Union has produced Guidelines for standard developers to address the needs of older persons and persons with disabilities [European Committee... 2002] where the methodology of regulating all sorts of technical requirements is related to the needs of people with different physical and even mental disabilities. It is essential that ensuring accessibility and non-discrimination of people with disabilities is a compulsory requirement for any project to get funding from the EU Structural Funds and Cohesion Funds [Ensuring Accessibility... 2009]. In this way, economical instruments are used to accelerate implementation of accessibility measures across the whole EU territory. The Build-for-All principle is dominating European regulation documents as well as design manuals and guidelines. The principle advocates for the concept of universal design that focuses on the efforts of professionals to equally respect the diverse needs of all members of society in planning and design, construction, maintenance and product design.

The first regulation in Lithuania that was adopted in 1994 opened the new area for the national authorities, the city planners, the architects and the owners. In 2001 a modern Regulation for Construction “Buildings and Environment: Requirements for People with Disabilities” [Parliament... 2001] was adopted. During the 19 years of practice, one could notice great impact of these documents on the quality of access to the built environment in Lithuania.

Analysis of the Accessibility in the Built Environment 2007 code in Singapore [Code... 2007] reveals several exemplar ideas to follow also some to add and develop in the code further. The diverse interests of children and the elder citizens are well covered by the code by requirements. Related to the accessibility survey in Singapore this aspect served as a reason to extend the survey team by representing the interests of a family with children and the elderly citizens. Aspects of pedestrian crossings and street crossings, locating rest places for the disabled and the elder people and families in open areas as well as in the buildings, signage including warning surfaces and way-finding systems are all still poorly covered by the Code. Therefore, this aspect should be investigated and elaborated in detail, and the new solutions should be researched and provided for the planners and architects.

## **METHODOLOGY OF ACCESSIBILITY SURVEY IN SINGAPORE**

The survey carried out in Singapore was based on the methodology developed in a partnership between the researchers of Vilnius Gediminas Technical University led by the author of this paper and their counterparts at Helsinki University of Technology (currently Aalto University). The method of accessibility checklist is used for testing and evaluating urban environment by the planners, the owners or the users as presented in The Americans with Disabilities Act Accessibility Guidelines ADAAG Checklist for Buildings and Facilities [United States... 1994]. In order to get the responses based on a direct experience of the users the survey team was comprised of people representing all major segments of disability and included: a person with walking difficulties, a wheelchair using person, a blind person and a sight-impaired persons, a deaf person and hearing impaired person. The method was applied earlier for testing accessibility of public facilities in Vilnius City, Lithuania [Stauskis 2005]. In order to represent the needs of the ageing population and the families, an elder person and a young Singaporean family with an infant baby were involved into the survey team.

The survey group was also demographically diverse: the age of the surveyors ranged from 9 months to over 65 years of age. The range of professions was also broad, from office employees and civil servants to homemakers, children and retired people. The sociological representation of a survey team covered around 70% of the overall demographic structure of society groups in Singapore.

The author of this paper has programmed and managed the survey as a user's experience reported from the spot of testing as a method different from an expert's evaluation. The survey manager has instructed the team members about the goals, the method and the expected results of the case study. For recording the members experience survey questionnaire was prepared in advance and adjusted to the specifics of Singapore's legal

and urban environment. The survey was structured in three chapters representing different urban scales: urban areas (20 aspects), buildings and facilities (24 aspects), environment and building elements (13 aspects), in total 57 questioned aspects. Qualitative evaluation was turned into a quantitative by grading each aspect in range from 0 to 10 (Table 1). The surveyors examined the same areas and facilities to make their reports comparable. The survey manager has been verifying the responses of individual evaluator to make the results comparable, reliable and referable.

Table 1. Quality and accessibility grading score and index

Quality Evaluation	Grading score	Graphical index
Low	0–4	
Poor	5–6	
Good	7–8	
Excellent	9–10	

Different methods are used by researchers to select the sites for survey, and most frequently health, retail, local authority and leisure sectors are included [Lewis et al. 2005]. Access condition of the walking routes from metro stations to the final destinations were analysed in Beijing [Sun et al. 2016], while the metro stations themselves – not yet. Accessibility of the city centre is vitally important for consumers and makes a planning implication [Bromley et al. 2007], therefore Singapore city centre sites were chosen for the survey. Therefore, while selecting the sites for the survey we minded the following principles:

- a. One central MRT station in dense urban context.
- b. One peripheral MRT station in mass housing area.
- c. One hotel complex as a temporary residence and services facility.
- d. One café as a point of attraction in a busy public area.

Based on that, five objects on two sites were selected for this survey. MRT (MRT – Mass Rail Transport in Singapore) station based sites were selected as mobility in Singapore is a key issue and public transport system is carrying over 60% of passengers daily. Dhoby Ghaut district is the busiest downtown business, commerce and infrastructure area (Fig. 4) while the other one – Lavender area is more residential with developed commercial and business services (Fig. 5). The basic concept of site selection is based on an the selection of urban complex with MRT station as a connecting infrastructure facility and its building, public area and commercial facilities around that and it makes them one multifunctional integrated urban area.



Fig. 4. Dhoby Ghaut MRT, Plaza Singapura and Starbucks café area



Fig. 5. Lavender MRT area and V-Hotel Singapore

## RESULTS

The survey demonstrated the relative level of accessibility represented by the grading results of all surveyed facilities by the members of a survey group (Fig. 6, 7). The survey results (Table 2) reveal that the overall average accessibility for all surveyed sites was graded at 6,61 (where maximum is 10). The highest level of accessibility was found in the section of building (7,02), and the lowest level was detected in the section of urban areas (6,40) and site and building details [Harrington et al. 2009] whereas the difference between the highest and the lowest averages of these three sections is around 10%.

The final score for evaluating certain facility in a particular chapter was obtained by deriving an average from evaluation score given by all personal surveyors, and the averages for the facilities and for the environment chapters have been obtained in the same way of an arithmetic average of all scoring positions. The discussion of the survey results in each chapter is presented by outlining three most actual items from the questionnaire list that got the lowest score.

Situs	Situs/lokasi	Aksesibilitas Fasilitas																													
		Lingkungan										Bangunan										Detail Arsitektural									
		1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
I Dhoby Ghaut	Jalan	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	Tempat	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	Tempat	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
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	Tempat	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
II Starbucks	Jalan	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	Tempat	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	Tempat	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	Tempat	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	Tempat	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
III Lavender	Jalan	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	Tempat	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	Tempat	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	Tempat	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	Tempat	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
IV Hotel	Jalan	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	Tempat	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	Tempat	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	Tempat	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
	Tempat	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7

Fig. 6. Summary of accessibility evaluation (0–10) of urban site environment (I), building (II) and architectural details [Lewis et al.] at the four surveyed sites (G. Stauskis picture)

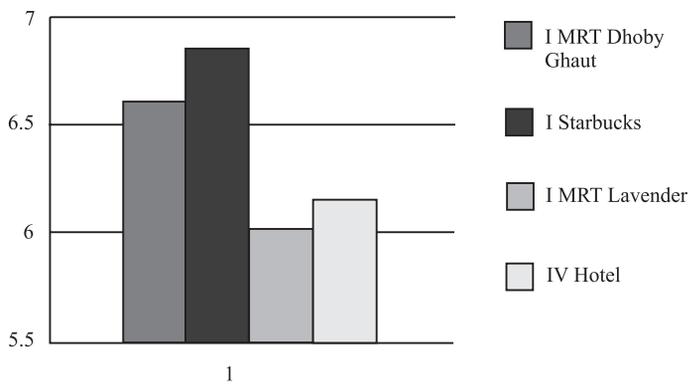


Fig. 7. Average accessibility evaluation chart of urban area environment of the four surveyed sites (G. Stauskis pictures)

Table 2. Average accessibility evaluation grades for the urban, the building and the details scales.

Facility	Urban area	Building	Details	Average
Dhoby Ghaut MRT	6,59	6,92	6,65	6,72
Starbucks cafe	6,85	7,16	6,39	6,8
Lavender MRT	6,01	6,99	6,61	6,54
V-Hotel Lavender	6,15	6,99	6,01	6,38
Total average:	6,4	7,02	6,42	6,61

## DISCUSSION

The discussion and recommendations are based on the results of evaluation given by the members of the group as well as their comments on different evaluation aspects.

Quality of *pedestrian walks* was evaluated as needing urgent improving in access by most of surveyors. The way pedestrian sidewalks are planned in many of evaluated cases lack connectivity and often driving lanes cut through them what makes walking unsafe, confusing and unpleasant. *Pedestrian crossings* need new and better solutions for the disabled people and all pedestrians on Singapore streets (Fig. 8, 9). The bus stops were outlined as element of environment that need better access, including area around the bus stops that is serving as an accessible path, the platform and the information system.



Fig. 8. Safety of pedestrians is compromised by crossing the wide motorway (a). Street crossing lacks signage of crossing direction (b) (photo by G. Stauskis)



Fig. 9. Pedestrian walkway is crossed by the car drive in (photo by G. Stauskis)

Lack of the *rest areas* is another critical issue. Public rest places should be carefully planned minding their location, track, section and services before their actual installation (Fig. 10). In some countries the distance of 150 m is regulated as the longest run between the installed accessible rest areas. Bridges and underpasses were outlined as the element

in urban area that causes multiple problems and therefore needs better solutions. For people with some disability, e.g. walking difficulties, the bridges over the urban highways without a lift are an absolute obstacle that they could not cope with. The bridges over the motorways without a lift and even with it are greatly discouraging walking for all pedestrians as they make a simple street cross a great challenge requiring also definite physical efforts.



Fig. 10. Rest areas are essential in public space besides the MRT station (a). Commercial Square (b) to allow for the rest of people. G. Stauskis pictures.

Accessibility level in *places of assembly* as public lobbies and entrances were outlined as needing urgent improvement (Fig. 11). The quality features of access to the building, the space around the main entrance, the quality of entrance and the moving around require quality solutions in their planning and design. The access to public amenities as *public toilet facilities* is another sensitive item in the chain of accessible environment. The missing signage for a way finding to the amenities, the entrance door and the space inside requires better solutions to allow for the disabled people as well as many other users to use them safely and easily.

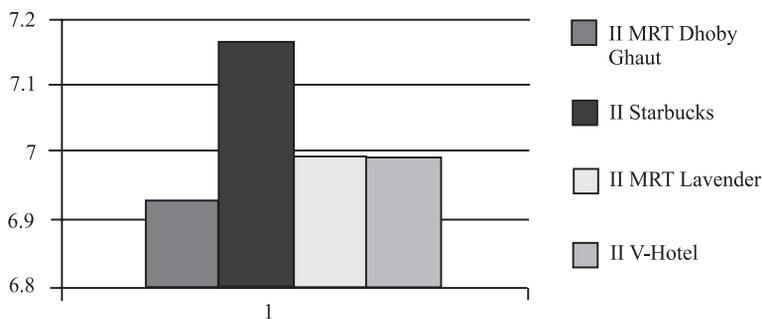


Fig. 11. Accessibility evaluation chart of the four surveyed *buildings* (G. Stauskis picture)

It was mentioned by many surveyors that the access to recreation and gym facilities should be provided for all visitors that everyone could take part and not just be an observer. Swimming pool at V-Hotel Lavender still has to make the facility fit for all (Fig. 12).

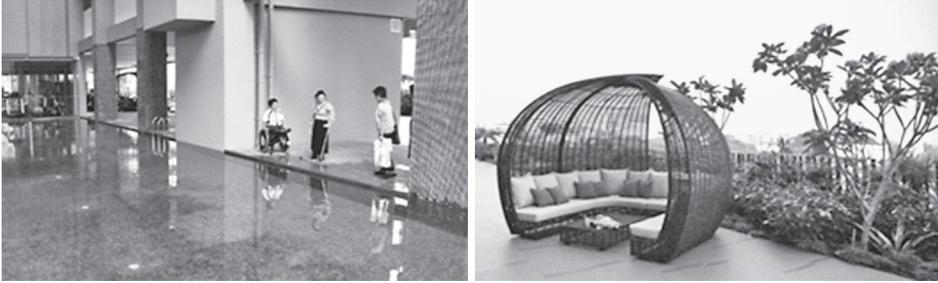


Fig. 12. Accessibility survey at V-Hotel (photo by G. Stauskis)

The part of *environment and building elements* is the other low-ranked part of environment (Fig. 13). Small size and scale of these elements in no way means that they are least important than the site or the building itself. Proper instalment of *warning elements* got a low score because the warning elements were missing at critical points in open areas and in buildings (Fig. 14, 15, 16). Therefore, the visitors in their activity encounter with danger of falling, hitting or injuring himself or herself. Another area of extreme importance for safety and security as well as for the comfort of use of any public are is *proper signage* of the important interior and exterior elements. This covers firstly proper location and visibility of the signs in certain system of sequence. It is important to provide safe and comfortable orientation at night same as in the day period. Colour and light contrast and design of the signs and their systems should improve.

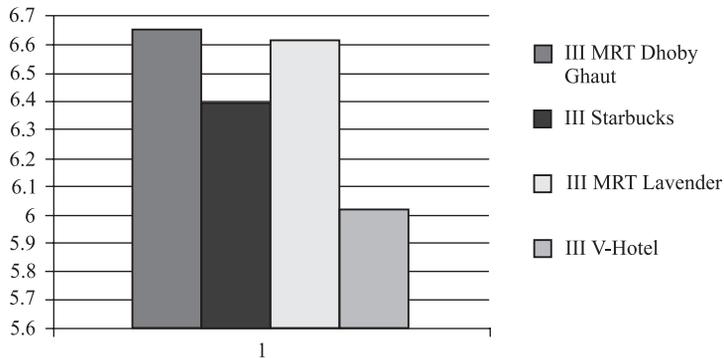


Fig. 13. Accessibility evaluation chart of *environment and building elements* at the four surveyed sites (G. Stauskis pictures)

The surveyors outlined safety of walking pedestrians and the ease of connections for cyclists as an issue. For the comfort and the safety of both it is essential to plan a designated cycling tracks and cycling lanes to separate cycling and walking by clear signage. Application of *IT based solutions* and products in urban area and in buildings was outlined as an important aspect of improving public areas to provide the person with sight impairment with information about the obstacles, the crossing, the bus stop, the toilet location, etc. Personal receivers could transfer this information to a user immediately without disturbing the others.



Fig. 14. Tactile warning surfaces contrast in different colours (photo by G. Stauskis)

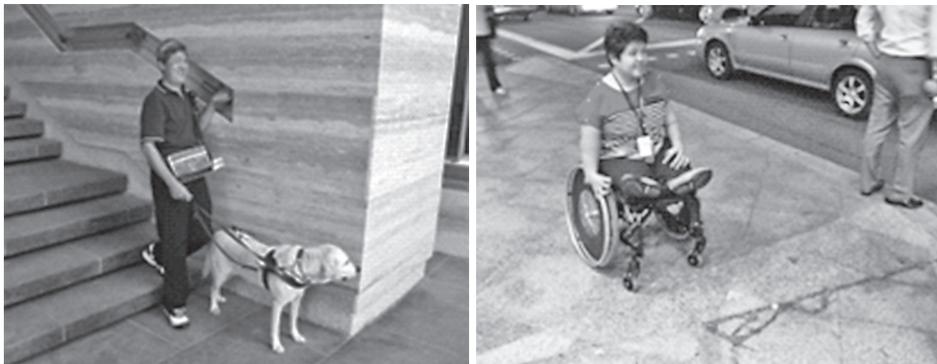


Fig. 15. The confusingly overdesigned handrail is too high to reach and does not serve its real function (a). Accessible travel route has sudden level changes (b) (photo by G. Stauskis)

The average level of accessibility represents the level of safety, functionality and comfort in public environment including buildings and spaces. The goal is to have accessible environment but this is certainly a process going through the phases of understanding, analysis, design, use and maintenance. The difference between the ideal (10) and the real situation shows to what extent access is limited and what share of visitors have problem to use the area or facility. The overall average accessibility level of the evaluated facilities in Singapore survey was graded at 6,61 (Fig. 17, Table 2). It is important to



Fig. 16. Cycling in a mixed flow can obstruct pedestrian movement (a). Bikes are parked by railing at MRT station as bike parking stands are missing (b) (photo by G. Stauskis)

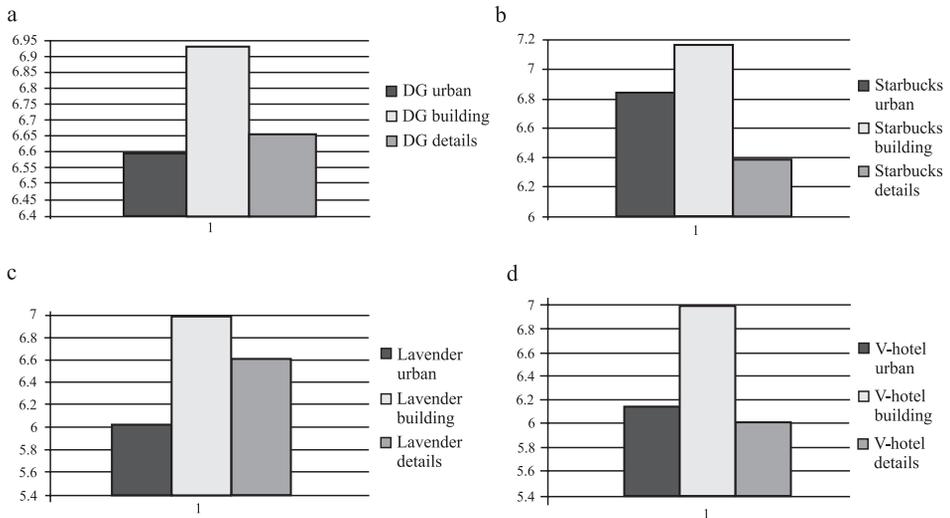


Fig. 17. Average accessibility evaluation of site, building and detail's sections at Dhoby Ghaut MRT station and Plaza Singapura (a), Starbucks Café at Dhoby Ghaut MRT station (b), Lavender MRT station (c) and V-Hotel Lavender (d) (G. Stauskis pictures)

notice that the scores were assigned by the surveyors with different types of disabilities evaluating accessibility of the same sites at the fixed time interval and therefore the survey is complex and it reflects the real time evaluation with minimal distortion and subjectivity. For the comparison, accessibility survey based on the same methodology and adjusted criteria that was performed earlier in the six sites of Vilnius City, Lithuania got the overall score of 6,28, so the average score obtained in Singapore is by 5,3% higher than in Vilnius City case [Stauskis 2005]. The distribution of accessibility levels between the site, the building and the detail's parts in Vilnius City survey demonstrated similar trends as in Singapore case: the level of access for the site part was 5,61, for the

building's part – 7,33 and 5,89 for details. The most important outcome of the survey is the conclusion that in both cases *the site* and *the details* sections featured lower scores than the building's section. Consequently, we should take these parts of environment on a priority list to urgently re-plan and refurbish. It should be underlined that comparison could be drawn only for same type buildings in a similar environmental situation assessed by the same assessors, which is not the case. Still comparison is possible with a certain part of uncertainty and deviation.

## CONCLUSIONS

Developing and implementing coordinated accessibility programme is an important process of improving life quality for Singapore's citizens. The open space of an urban area is the most important element of the city, especially in the hot humid climate zone as in Singapore where people tend to spend more time outside than in buildings. The research proves this segment of environment needs special attention of city planners and managers.

Improvements have to be made to Singapore Accessibility Code towards gaining more safety, quality and satisfaction in public environment. Spheres of site planning (rest areas, pedestrian walks, crossing), details, and elements of buildings (way-finding, warning surfaces, tactile information) should be revised in order to present more detailed requirements for planners and architects. The code on transport deserves most attentive revision in order to provide more safety and comfort requirements for a balanced mobility in Singapore, especially having in mind the needs of citizens with limited mobility.

The comprehensive programme for accessible environment is a strong tool to gain notable achievements in a desired period. The cross-sectorial and multi-professional approach to redevelopment, construction, streets, and parks need involvement of local authorities as well as associated groups of interested users representing the full range of disabilities. Good planning, implementation and coordination could bring the desired results.

The performed research has demonstrated that involvement of the real users into the scientifically built research adds objectivity and helps to mind important and specific aspects of accessibility. The complex survey allows presenting its results in a comprehensive form where the weak point and areas are visibly identified. As a result, one these could take these areas to a priority list for the forthcoming accessibility programmes. Urban areas and interior elements are the least accessible parts of environment and therefore deserve the most attention from professional designers and the authorities.

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## REFERENCES

- Baris, M. E., Uslu, A. (2009). Accessibility for the disabled people to the built environment in Ankara, Turkey. *African J. Agric. Res.*, 4, 801–814.
- Bhakta, A., Pickerill, J. (2016). Making space for disability in eco-homes and eco-communities. *Geograph. J.*, 182, 406–417.
- Blasco, R., Marco, A., Casas, R., Cirujano D., Picking, R. (2014). A Smart Kitchen for Ambient Assisted Living. *Sensors*, 14, 1629–1653.
- Bromley, R.D.F., Matthews, D.L., Thomas, C.J. (2007). City centre accessibility for wheelchair users: The consumer perspective and the planning implications. *Cities*, 24, 229–241.
- Chard, G., Couch, R. (1998). Access to higher education for the disabled student: a building survey at the University of Liverpool. *Disability & Society*, 13, 603–623.
- Code on Accessibility in the Built Environment (2007). Building and Construction Authority, Singapore. <http://www.bca.gov.sg/BarrierFree/others/AccessibilityCode2007.pdf> [22.02.2017].
- Davidsson, N., Sodergard, B. (2016). Access to Healthcare among People with Physical Disabilities in Rural Louisiana. *Social Work in Public Health*, 31, 188–195.
- De Ipina, J. M. L., J. Rubio, B. Rubio, A. Viteri, C. Vaquero, C., Pelaz, A. (2007). Virtual Reality: A Tool for the Disabled People Labour Integration. [In:] *Challenges for Assistive Technology*. Eds. G. Eizmendi, J.M. Azkoitia, G.M. Craddock. IOS Press, Amsterdam, 141–145.
- Enhancing Physical Accessibility for All. Land and Transport Authority, Singapore, <http://www.lta.gov.sg/content/ltaweb/en/public-transport/system-design/enhancing-physical-accessibility-for-all.html> [22.02.2017].
- Ensuring Accessibility and Non-Discrimination of People with Disabilities. Toolkit for Using EU Structural and Cohesion Funds (2009). European Commission Office for Official Publications, Luxembourg, [http://www.qca.pt/publicacoes/download/Fully\\_accessible.pdf](http://www.qca.pt/publicacoes/download/Fully_accessible.pdf).
- European Committee for Standardisation (2002). Guidelines for Standards Developers to Address the Needs of Older Persons and Persons with Disabilities. CEN/CENELEC Guide 6. Brussels, [ftp://ftp.cen.eu/boss/reference\\_documents/guides/cen\\_clc/cen\\_clc\\_6.pdf](ftp://ftp.cen.eu/boss/reference_documents/guides/cen_clc/cen_clc_6.pdf) [22.02.2017].
- European Network for accessible Tourism (2015). Stockholm: The Most Accessible Capital in the World by 2010, [http://www.accessibletourism.org/?i=enat.en.enat\\_projects\\_and\\_good\\_practices.549](http://www.accessibletourism.org/?i=enat.en.enat_projects_and_good_practices.549) [31.05.2016].
- Evciil, N. (2010). Designers' Attitudes Towards Disabled People and the Compliance of Public Open Places: The Case of Istanbul. *Europ. Planning Studies*, 18, 1863–1880.
- Friedner, M., Osborne, J. (2013). Audit Bodies: Embodied Participation, Disability Universalism, and Accessibility in India. *Antipode*, 45, 43–60.
- Gant, R. (1997). Pedestrianisation and disabled people: a study of personal mobility in Kingston town centre. *Disability & Society*, 12, 723–740.

- Harrington, A.L., Hirsch, M.A., Hammond, F.M., Norton, H.J., Bockenek, W.L. (2009). Assessment of Primary Care Services and Perceived Barriers to Care in Persons with Disabilities. *Amer. J. Physical Medicine & Rehabilitation*, 88, 852–863.
- Klaesson, L., Nilsson, C., Malm, S., Johnni, P. (2008). Stockholm – En Stad for Alla. Trafikkontoret Stockholm. Blomquist Annonsbyrå AB, 128 p. <http://www.stockholm.se/PageFiles/935729/TRK145%20Handbok%20Tillg%20c3%83%20c6%92%20c3%82%20a4nglighet%20080815%20HighQ.pdf> [24.03.2017].
- Lewis, C., McQuade, J., Thomas, C. (2005). Measuring physical access barriers to services: ‘Snapshot’ research in 4 town/city centres in Britain. *Intern. Congress Series*, 1282, 1034–1037.
- Meshur, H.F.A. (2016). Evaluation of urban spaces from the perspective of universal design principles the case of Konya/Turkey. *Tema-Journal of Land Use Mobility and Environm.*, 9, 192–209.
- Parliament of the Republic of Lithuania (2001). Technical Regulation for Construction STR 2.03.01:2001 „Buildings and Territories. Requirements for People with Disabilities”, <https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.139277/UnEpUjanZp> [22.02.2017].
- Pudelska, K., Dudkiewicz, M., Durlak, W., Parzymies, M. (2016). Ranga dawnych i współczesnych ogrodów terapeutycznych. *Acta Sci. Pol., Formatio Circumiectus*, 15(1), 125–137.
- Rea, M., Figueiro, M. (2016). Light as a circadian stimulus for architectural lighting. *Lighting Res. Technol.*, Dec. 6, 1–14.
- Stauskis, G. (2005). Methodology for Testing and Evaluating Accessibility in Public Spaces. *Town Planning and Architecture*, 29(3), 147–154, <http://www.tpa.vgtu.lt/lt/3/NR/PUB/2566> [31.05.2016].
- Sun, G.B., J. Zacharias, B.M., Oreskovic, N.M. (2016). How do metro stations integrate with walking environments? Results from walking access within three types of built environment in Beijing. *Cities*, 56, 91–98.
- Sustainable urban mobility plans (2015). Guidelines. Developing and implementing a sustainable mobility plan, <http://eltis.org/content/sump-process> [22.02.2017].
- United States Access Board (1992). Americans with Disabilities Act Accessibility Guidelines (ADAAG). Checklist for Buildings and Facilities, <http://www.access-board.gov/adaag/checklist/a16.html> [22.02.2017].

## **METODOLOGIA OCENY DOSTĘPNOŚCI JAKO NARZĘDZIA ZWIĘKSZANIA SPOŁECZNEJ REAKCJI KRAJOBRAZÓW MIEJSKICH W SINGAPURZE**

**Abstract.** Dostępność różnych miejsc w przestrzeni publicznej wywiera istotny wpływ na udział obywateli w życiu publicznym. Jakość dostępu do krajobrazów i budnków w mieście nabiera specjalnego znaczenia w kontekście ostatnich trendów demograficznych w krajach rozwijających się, takich jak starzenie się społeczeństwa, malejące wskaźniki urodzeń i postępująca urbanizacja środowiska naturalnego. Tworzenie bardziej elastycznego otoczenia miejskiego stanowi instrument ułatwiający integrację społeczną i włączanie się w życie publiczne, zwłaszcza ludziom z ograniczeniami ruchowymi, zamiast odcinać ich od społeczności poprzez rozszerzanie usług socjalnych. W niniejszym artykule autor prezentuje opartą na badaniach metodologię oceny dostępności przestrzeni publicznej w dużym mieście. Oryginalność metody polega na umożliwieniu osobom niepełnosprawnym odgrywania czynnej roli ekspertów w ocenie dostępności zgodnie z wypracowanymi narzędziami tej oceny. Użyta metodologia pozwala wartościować dostępność w różnych skalach – w skali krajobrazu miejskiego, w skali budynków i w skali ich wnętrza.

Prezentowane stadium przypadku dotyczące Singapuru bada jakość dostępu ludzi do przestrzeni publicznej, stacji metra, hoteli i kawiarni. Jako rezultat swego stadium autor rekomenduje poprawę dostępności w mieście przez podniesienie jakości środowiska miejskiego i projektów architektonicznych, aktualizowanie przepisów budowlanych, a także aranżowanie przestrzeni i wznoszenie budynków o charakterze otwartym. Studium przedstawia kompleksowy plan działania służący eliminacji barier w specyficznym środowisku Singapuru i w innych miastach. W konkluzji prezentuje model narzędzia monitorującego dostępność i program naprawczy, które ułatwić mają tworzenie środowiska miejskiego odpowiadającego potrzebom społecznym.

**Słowa kluczowe:** ocena dostępności, przestrzeń publiczna, krajobraz, zrównoważony rozwój, normy budowlane, niepełnosprawność

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