

ALIGNMENT OF INFRASTRUCTURE AND ASSISTIVE TECHNOLOGY: MAPPING THE ACCESSIBILITY OF SOKOBANJA TOURIST ATTRACTORS FOR WHEELCHAIR USERS

ABSTRACT

This research examines the accessibility of Sokobanja Spa for people with physical disabilities who use wheelchairs as assistive technology. The study analyses the relationship between the spatial morphology of the spa settlement, its tourist attractors, and the accessibility of urban and natural environments. The research applies a mapping method to identify barriers and assess the degree of spatial accessibility for wheelchair users. Attractors, such as cultural heritage sites, public spaces, natural areas, and wellness facilities, are categorised as point, linear, or surface elements and evaluated according to their accessibility. The study identifies alignment between the spatial organisation of spa facilities and the accessibility of their activities. The results reveal that although the central promenade and main public areas are relatively accessible, significant barriers remain in areas with steep terrain and heritage buildings. The research contributes to the understanding of how assistive technologies interact with the built environment and proposes that mapping can serve as a methodological tool for improving accessibility and guiding inclusive spatial planning in spa settlements.

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KEY WORDS

SPA INFRASTRUCTURE
ACCESSIBILITY
WHEELCHAIR USERS
MAPPING
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1. INTRODUCTION

The therapeutic properties of thermal springs were recognised as early as the Roman period, when such places served not only for healing but also for leisure, cultural activities, and social interaction. Medical tourism involves users travelling for treatment and medical intervention. In contrast, wellness tourism focuses on pleasant and satisfying experiences that enhance personal well-being, aiming to reduce stress and establish the balance of body, mind, and spirit (Dimitrovski, Marinković, Đorđević, & Sthapit, 2024). Research in the area of tourism highlights Serbia's potential to develop a wellness tourism model through the management and privatisation of spas, following examples from other parts of Europe (Arsić, Vujko, & Knežević, 2024). The significance of spas for people with disabilities is evident in all of these aspects, particularly regarding medical services that support rehabilitation and alleviate symptoms associated with disability. At the same time, wellness tourism provides psychological and emotional benefits by reducing stress.

This paper explores the accessibility of the infrastructure and activities of Sokobanja Spa settlement for people using wheelchairs, focusing on the spatial compatibility with assistive technologies. Persons with limited mobility were selected as the target group due to the relevance of medical tourism in easing their physical difficulties. Currently, there is minimal knowledge about the barriers that affect the participation of wheelchair users in spa-related activities. When visiting a spa, a person using a wheelchair is rarely informed about the obstacles they might encounter or how they shape their overall experience (Michopoulou & Hilton, 2021). The main aim of the research is to identify spatial barriers and to create a database and map that can both inform wheelchair users about accessible spa infrastructure and assist local authorities in understanding which barriers must be removed to achieve systematic functionality of the settlement. The research, therefore, examines the current state of accessibility in Sokobanja and identifies which attractions are available to people with disabilities. Based on this aim, the hypothesis is that the morphology and functioning of the spa settlement reveal discontinuities between the provided spa activities and their accessibility for people with disabilities. Following the introduction—which outlines the subject, research question, objectives, hypothesis, and structure of

the paper—the study presents a contextual framework that describes the social and medical models of disability, the importance of accessibility, and the role of assistive technologies. This section also explains the criteria for selecting Sokobanja as a case study and provides a brief overview of its historical development. The methodology describes the models used for identifying and mapping barriers, followed by the presentation and discussion of results, and finally the conclusion summarising the key findings of the research.

2. CONTEXTUAL FRAMEWORK OF THE RESEARCH

2.1. Disability, Accessibility and Assistive Technologies

According to the 2011 census, 571,780 residents of the Republic of Serbia were identified as persons with disabilities, representing approximately 8% of the total population (Lazarević, et al., 2022). These figures should be interpreted with caution, given the complexity of the topic and the changing definitions of impairment and disability. According to the World Health Organisation, more than one billion people worldwide currently live with some form of disability, which accounts for around 15% of the global population. In contemporary terms, impairment refers to a physical characteristic of an individual that, within a social context, marks them as a person with a disability (Gissen, 2023). This distinction is crucial because it emphasises that impairment is not the defining characteristic of a person, but instead that disability is socially constructed.

Until the mid-twentieth century, disability was perceived as an individual's medical problem that needed to be corrected. Within this model, the focus was placed on the individual and their ability to adapt through treatment, medication, and the use of aids, supported by the state. Disability was regarded as an individual problem, and the task of professionals was to “bring” a person closer to socially accepted norms of life. When this was not possible, people were often placed in special institutions, isolated from social life, where experts assumed responsibility for their care. By the late 1970s, the social model emerged as a response to the medical approach. It assumes that disability does not result from an individual's impairment but from the barriers that society creates through unadapted spaces and a lack of systemic support. Within this framework, it is the responsibility of society to ensure equal participation for all its members. The social model became the basis for the later human-rights approach, which underpins the United Nations Convention on the Rights of Persons with Disabilities (Ružičić-Novković, 2014).

Disability can be defined in various ways, but in this study, functional classification is important, where functioning encompasses the full range of human activities — physical, mental, social, and participation. Based on impairment, disability may be categorised as physical, psychological, or multiple (Budimirović, 2024). Physical impairments include sensory and bodily impairments. The former refers to impairments of vision, hearing, or speech, while the latter involves the locomotor system, central and peripheral nervous systems, chronic illnesses, and psychomotor disorders. This research focuses on people with physical disabilities that cause difficulties in walking.

Despite the significant role of spas as places for treatment, social interaction, and recreation, spa facilities are often not accessible to people with disabilities. This assertion is well-known from firsthand experiences and the general inaccessibility of spaces worldwide, regardless of typology. However, there is no database indicating the accessibility of spa spaces. The most common barriers faced by people with disabilities include prejudice and negative stereotypes, inaccessible infrastructure, and limited access to education, employment, and social life (Budimirović, 2024). Besides the fact that spas should be accessible for social inclusion and access to treatment, they are legally required to be accessible under the Convention on the Rights of Persons with Disabilities, of which Serbia is a signatory. Mobility impairment often results in a higher degree of social exclusion, negatively affecting the physical, psychological, and emotional well-being of vulnerable social groups. This is why removing physical barriers is a key component of conventions, strategies, and action plans that set goals and establish legal frameworks for improving the status of persons with disabilities (Lalović, 2018).

Access to elements of urban structure represents one of the fundamental urban needs of modern humans. According to Prof. Dr Vladan Đokić, access to a city square can be examined from two perspectives. One relates to spatial physical access, i.e., access concerning only the morphological characteristics of the space, as well as access to certain activities occurring in that physical space (Đokić, 2009, str. 63). Improving access to the square, as well as other elements in urban and rural areas, represents one of the basic preconditions that would contribute to their better functioning. In this study, special emphasis is placed on access to activities taking place in the analysed space. The term accessibility, when used in the context of disability, implies that people with disabilities can reach facilities and use amenities without the assistance of others and without feeling like objects of charity (Michopoulou & Hilton, 2021). Accessibility represents a fundamental precondition for the full and equal participation of people with disabilities in social life. Article 9

of the Convention on the Rights of Persons with Disabilities emphasises the obligation of signatory states to take measures ensuring access to the physical environment, transportation, information, and communication, including modern information and communication technologies, as well as other services and facilities available to the public. The issue of physical accessibility is the focus of this study, as it predominantly affects the independence of people with motor impairments (Lazarević, et al., 2022). Article 9 highlights the need for a combination of various measures to embed social justice for persons with disabilities into the activities and operations of goods and service providers (Imrie, 2014). Research on the current state of accessibility in different cities worldwide and the possibilities of integrating inclusive design into local policies is needed to enable better access to assistive technologies and contribute to the inclusion and participation of all users of assistive technologies in society (Patrick, McKinnon, & Austin, 2020).

Assistive technologies (AT) refer to specialised technologies that people use to adapt the way they perform tasks. AT, combined with properly designed spaces, enable access for people with disabilities. The use of assistive technologies is accompanied by a series of challenges caused by disorganised and non-adapted buildings and outdoor surfaces. These technologies include low-tech devices, such as glasses or wheelchairs, as well as high-tech devices like IoT and smart homes (SH) (Andone, et al., 2020). The use of wheelchairs allows individuals to overcome barriers arising from physical impairments that affect walking. In this research, the alignment of infrastructure with this assistive technology will be recorded.

2.2. Case Study Selection

Sokobanja was selected as a case study based on several key criteria. First and foremost, as previously emphasised, given the importance of medical and wellness tourism, the selected spa settlement needed to have a specialised hospital or rehabilitation centre, along with wellness tourism facilities. Accessibility issues are more pronounced in settlements developed on uneven or sloped terrain, making research in such locations particularly relevant. Sokobanja met all these criteria.

3. MATERIALS AND METHODS

Research methodology is based on a mechanism for identifying activities that can contribute to improving accessibility in a report on accessibility in Mongolia (Patrick, McKinnon, & Austin, 2020). This mechanism can be applied across different sectors to enhance accessibility and is not limited solely to physical modifications in spatial design (Figure 1). The essence of this approach lies in identifying a barrier, determining the conditions and requirements for its removal, identifying responsible actors, and implementing appropriate measures in accordance with these requirements. These measures achieve the most significant effect when they are part of a broader vision of an inclusive city and rely on clearly defined guiding principles. In this research, the emphasis will be on identifying barriers, while the results will define the conditions and requirements for overcoming them.

The Crip the Campus Map project (Liebermann, 2019) demonstrates the significance of mapping as a research method that goes beyond its conventional function of spatial representation to become a tool for analysing and understanding the social, bodily, and perceptual layers of space. In this project, mapping was used to critically examine the university campus from the perspective of bodies that deviate from normative standards, thereby challenging conventional spatial representations and dominant institutional narratives. The ability of mapping to reveal the relationship between space and bodily experiences makes it a relevant method in a broader research context, especially when the goal is to identify and interpret spatial patterns that shape accessibility and usability. In this study, mapping serves as a method for identifying barriers. The research methodologically refers to the previous research (Ristić, 2024), where mapping was conducted using comparative analytical drawings and tables.

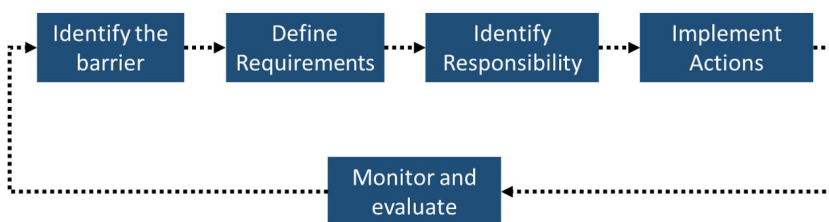


FIGURE 1. Mechanism for drafting action plans. Adapted from Patrick, M., McKinnon, I., & Austin, V. (2020). *Inclusive Infrastructure Case Study 1: Inclusive Design and Accessibility in Ulaanbaatar, Mongolia*. . Global Disability Innovation Hub and partners for the.

3.1. Analytical table

For systematisation, the attractors listed on the Sokobanja Tourist Organisation website were recorded. In this research, attractors are defined as services and activities that can draw tourists for medical and wellness travel. The main attractors offered by this spa settlement include nature, waters and springs, heritage, gastronomy, events, and activities. For the selection of analysed contents, they were categorised into nature, springs (Table 1), heritage, events (Table 2), and activities (Table 3).

Type	Code	Program	Distance from the SH	>2km Or <2km	Spatial characteristic
NATURE	N1	Mountain Ozren	13 km	>2km	Area
	N2	Mountain Rtanj	23 km	>2km	Area
	N3	Mountain Bukovik	39 km	>2km	Area
	N4	Mountain Devica	14 km	>2km	Area
	N5	Mountain Slemen	54 km	>2km	Area
	N6	Mountain Krstatac	18 km	>2km	Area
	N7	Lake Vrmdza	15 km	>2km	Area
	N8	Lake Bovan	10 km	>2km	Area
	N9	The Moravica River	1,7 km	<2km	Linear
	N10	Ozren picnic area	5 km	>2km	Area
	N11	Sesalac Cave	19 km	>2km	Point
	N12	Vrelo picnic area	6,5 km	>2km	Area
	N13	The spring of the Moravica River	12 km	>2km	Linear
	N14	The forest park Cuka 2	0,1 km	<2km	Area
	N15	Picnic area Lepterija	2,4 km	>2km	Area
	N16	Picnic area Vrelo-Borici	0,3 km	<2km	Area
	N17	The Sopur spring	8,4 km	>2km	Point
	N18	Ocno and Kalinovica	5,8 km	>2km	Area
	N19	The waterfall Ripaljka	5,4 km	>2km	Point
	N20	Central City Park	1,7 km	<2km	Area
	N21	Banjica park	1,5 km	<2km	Area
	N22	Oštra čuka	9,9 km	>2km	Point
	N23	God's gate	15 km	>2km	Point
BATH	S1	The Turkish bath Amam	1,7 km	<2km	Point
	S2	Bath Banjica	1,5 km	<2km	Point
	S3	Spring Market	1,7 km	<2km	Point
	S4	Zdravljak	2 km	<2km	Point
	S5	Josanica spa	16 km	>2km	Area

TABLE 1. Attractors selection- Nature, Bath

HERITAGE	H1	The Jermencic Monastery	7,1 km	>2km	Point
	H2	Ancient town of Vrmdza	12 km	>2km	Area
	H3	The Church of the Assumption of the Blessed Virgin	15 km	>2km	Point
	H4	The Homeland Museum in Josanica	15 km	>2km	Point
	H5	The church of St. Ilija	12 km	>2km	Point
	H6	Milos's Residence	1,6 km	<2km	Point
	H7	The ethno-corner of Grudonj water mills	2 km	=2km	Point
	H8	The Church of the Holy Transfiguration of the Lord	1,3 km	<2km	Point
	H9	The gallery - heritage of Milun Mitrovic	1,4 km	<2km	Point
	H10	The Homeland Museum	1,4 km	<2km	Point
	H11	The Turkish bath 'Amam'	1,7 km	<2km	Point
	H12	The medieval town of Sokograd	2,4 km	>2km	Area
EVENTS	E1	Sokobanja Summer- summer stage Vrelo	0,75 km	<2km	Point
	E2a	The Marathon of wishes- Homeland museum	1,4 km	<2km	Point
	E2b	The Marathon of wishes- Wish tree park Banjica	1,5 km	<2km	Point
	E2c	The Marathon of wishes- Spring Rujnik			Area
	E3a	St. John Celebrations- Mountain Rtanj	23 km	>2km	Area
	E3b	St. John Celebrations- summer stage Vrelo	0,75 km	<2km	Point
	E4	Green Heart Fest- summer stage Vrelo	0,75 km	<2km	Point
	E5	Sports events- location undefined	undefined	x	x
	E6	Golden hands- marble promenade	1,6 km	<2km	Linear
E7	The first accordion of Serbia- summer stage Vrelo	0,75 km	<2km	Point	

TABLE 2. Attractors selection- Heritage, Events

ACTIVITIES	A2	Water park Podina	2,2 km	>2km	Area
	A3	Eco tourism- nature		<2km	x
	A4a	Wellness and spa- Hotel Sunce	1,9 km	<2km	Point
	A4b	Wellness and spa- Soko Terme	1,8 km	<2km	Point
	A4c	Wellness and spa- Nataly spa	0,6 km	<2km	Point
	A5	Extreme sports	undefined	x	x
	A6	Mountain biking- Rtanj Ozren	23 km, 13km	>2km	x
	A7a	Hunting and fishing- Moravica river	1,7 km	<2km	Linear
	A7b	Hunting and fishing- Lake Bovan	10 km	>2km	x
	A8a	Sports tourism- Stadium Bata Nole	1,6 km	<2km	Point
	A8b	Sports tourism- Podina fields	1,6 km	<2km	Point
A9	Summer stage Vrelo	0,75 km	<2km	Point	
A10	Mountain climbing-	x	>2km	x	
A11	Surrounding mountains Rural tourism- surrounding villages	X	>2km	x	

TABLE 3. Attractors selection- Activities

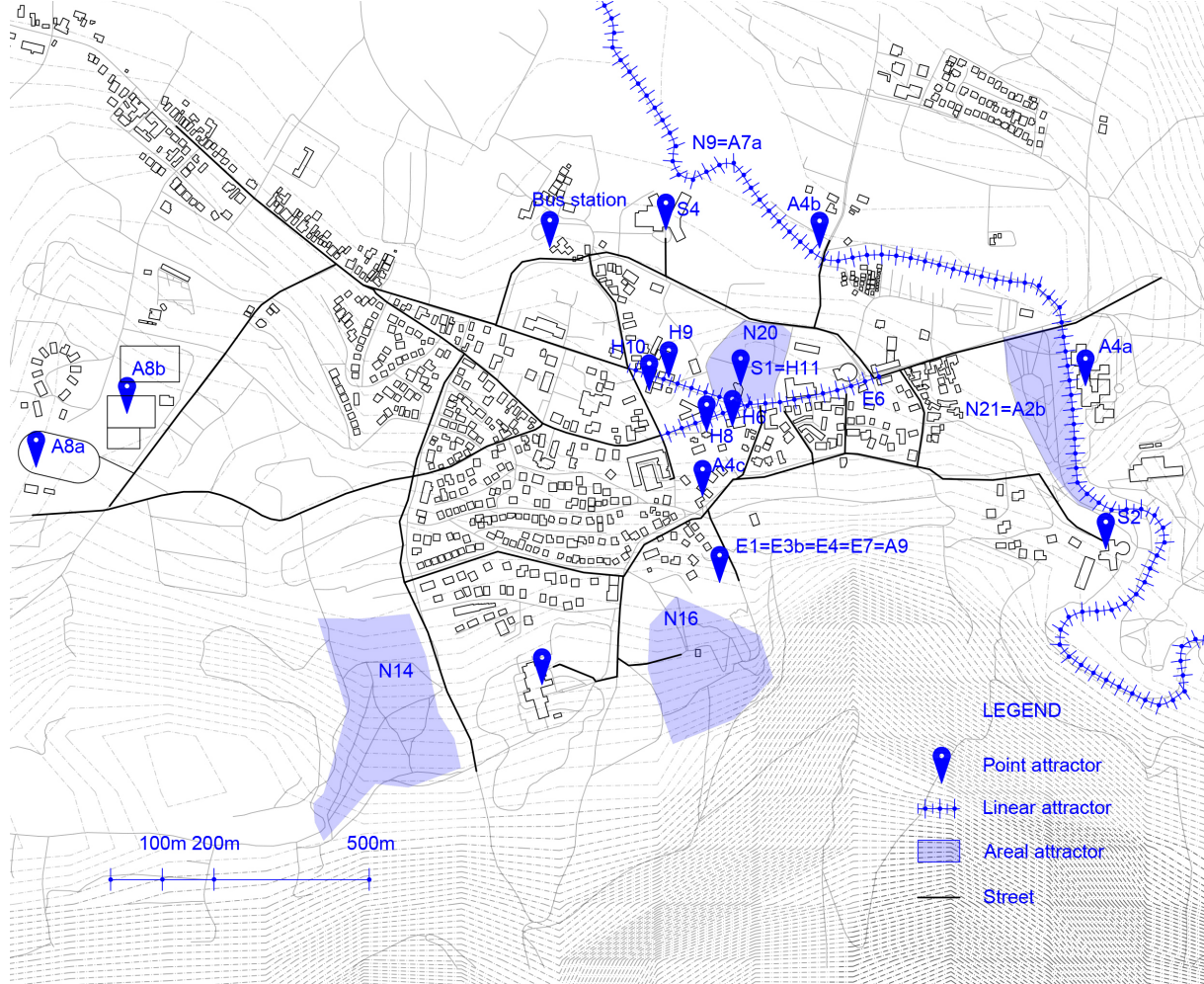


FIGURE 2. Map of streets and attractors. Source: Author illustration

The gastronomy category was not analysed because the settlement includes several restaurants both within and outside the settlement, making such an analysis less relevant for this study. The categories of attractors were compiled in tables, with each assigned a mapping code. The distance of each attractor from the Special Hospital was examined, and from the list of activities and supplements, only those within a 2 km walking or driving distance were selected. A specific criterion that was analysed is the spatial characteristic of the attractors. Attractors can be point-based, when an attractor occupies a small area; linear, when the content follows a clear path, such as a river or promenade; or area-based, such as a park or forest.

3.2. Analytical drawing

For the analysis of the systemic connectivity of the infrastructure, an analytical drawing was used. The drawing mapped the primary streets with sidewalks and attractors. Three main drawings were created: the first provides an overview of streets and attractors (Figure 2), the second analyses street accessibility, and the third examines the accessibility of attractors. The first drawing offers insight into the general structure of the settlement, while the second and third, analysed together, provide an understanding of the quality of accessibility within the settlement.

Streets represent an important communication route, connecting people with disabilities to other parts of the settlement, public institutions, and attractors, which are assigned to different categories. Due to the importance of streets in mobility, the majority are marked with a thick, solid green line to indicate passability. The inability to use sidewalks poses a risk even for people without mobility impairments. Although streets may be considered usable by wheelchair users, such communication is not entirely safe. Situations where sidewalks and streets present challenges are marked in yellow as moderately problematic. Sidewalks and pedestrian paths are significant because they constitute the only surfaces that wheelchair users can safely navigate. For point-based attractors within the urban structure, accessibility was analysed in relation to the number of steps and the presence or absence of a ramp. Accessible buildings are those that can be reached from the street level without steps or via an appropriate ramp. Accessible point attractors are marked in green. It was assumed that an average step height is about 15 cm. Moderately problematic attractors are those without street-level access but with up to six steps (90 cm), which would require an 11-meter-long ramp with one resting platform. Additionally, objects with physical access that are not clearly legible from the main entrance are also considered moderately problematic. Highly problematic attractors are those whose accessibility requires significant intervention, such as access with more than seven steps, ramps longer than 11 meters, or entrances that are too narrow, necessitating modification of the access zone.

For linear attractors, it is necessary to investigate whether they allow continuity of use and whether there are interruption points that make linearly arranged attractors inaccessible or problematic. Area-based elements must be analysed in relation to linear elements, i.e., the pedestrian paths within these areas. They are grouped into three categories: passable, moderately problematic, and highly problematic. Passable pedestrian paths are spaces that can be accessed from the street, without interruptions in movement, and with proper paving. Moderately problematic segments are those that can be easily resolved, while highly problematic segments require more substantial intervention. Moderately problematic segments include one low step, poor paving, inadequate material quality, or sidewalks with illegally parked vehicles. These are marked with a thin dashed yellow line. Highly problematic segments are areas where communication is impossible and are marked in red, with arrows indicating locations of height differences. A red arrow indicates an insurmountable height difference, a yellow arrow indicates a difference that can be overcome with difficulty, and a green arrow indicates a difference that is easily navigable. Based on the movement network, a qualitative assessment was made for area-based attractors as accessible, inaccessible, or problematic.

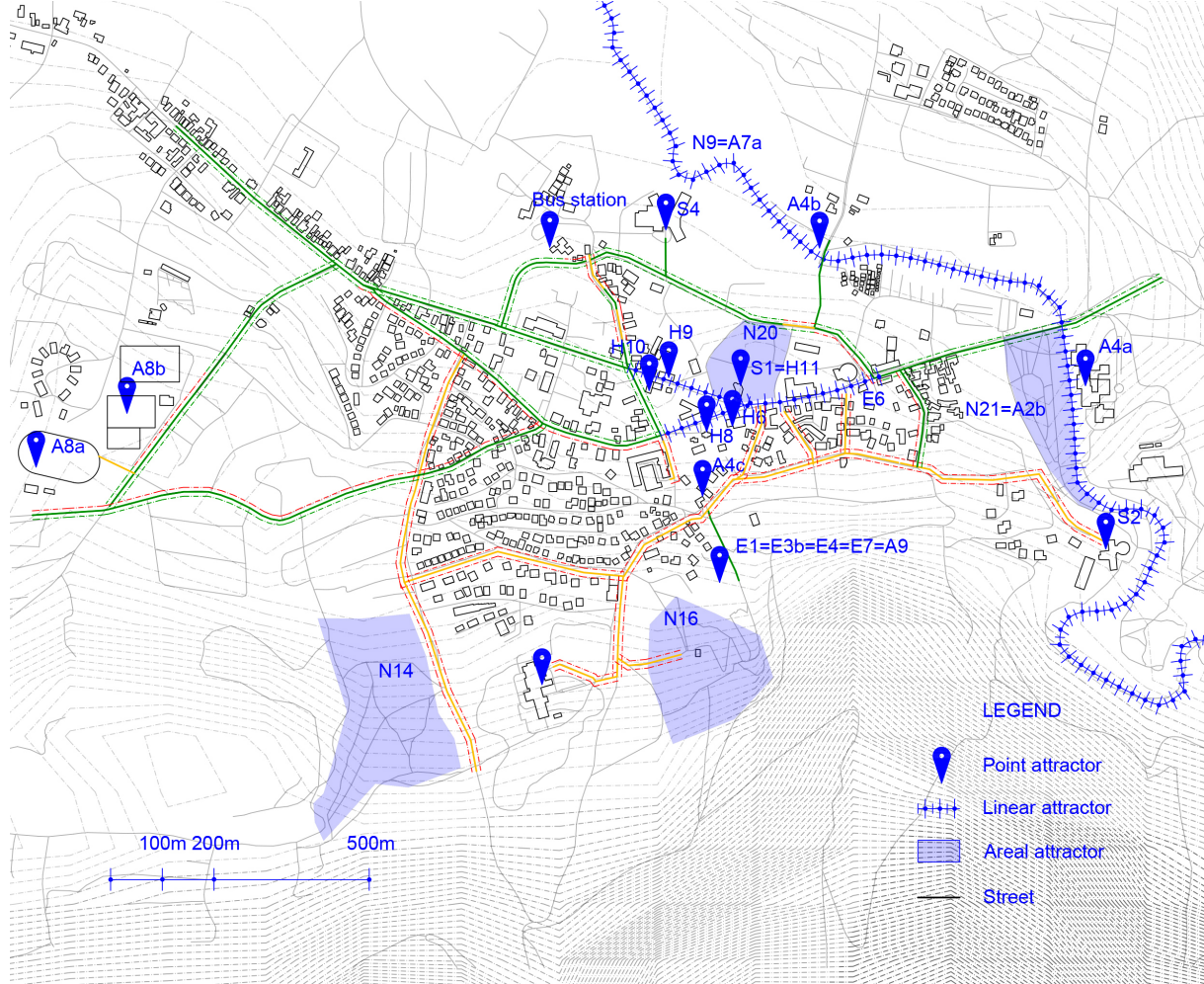


FIGURE 3. Map of the Morphological Characteristics of the Settlement and Accessibility. Source: Author illustration

4. RESULTS AND DISCUSSION

4.1. Analysis of the Morphological Characteristics of the Settlement and Accessibility

Analysis of the street layout and the evaluation of their accessibility revealed zones with functional sidewalks and zones where sidewalks are almost absent (Figure 3). Problematic areas are predominantly located where there are steep elevation changes. In a comparative study of the Cerak Vinogradi and Višnjička Banja settlements, it was observed that there is a correlation between the alignment of streets relative to contour lines (isohypses) and the accessibility of buildings. In Sokobanja, an organic street layout can be observed, following the isohypses both longitudinally and transversely. In the southern part of the settlement, near the Specialist Hospital, Forest Park Cuka 2, Picnic Area Vrelo-Borici, and Banjica Bath, streets are steep, aligned transversely to the isohypses, and lack adequate sidewalks. It should be noted that in rural areas, wheelchair use on streets is less problematic due to lower traffic intensity; however, steep slopes make streets unsafe due to the risk of loss of control, slipping, or falling.

It is also important to highlight that, despite the physical proximity of Hotel Banjica and Banjica Park on the map, there is a significant elevation difference between these two areas, and they are not spatially connected. Overcoming this elevation difference would require an elevator, which would significantly shorten the distance to access the natural areas visible from Hotel Banjica. For this analysis, the Specialist Hospital and the Bus Station were included in addition to the attractors listed on the official website. The hospital was included because distances to other attractors were measured from it. In its vicinity, there is a visually and sensorially rich health trail, which serves as an accessible linear attractor not listed on the website. The bus station was included as an important attractor because it connects the settlement with the rest of the country. The station is accessible, with no steps along the path; however, some pavement segments need restoration. Beyond architectural aspects, full accessibility would require information on which buses are wheelchair-accessible.

The central part of the settlement can be identified by a cluster of larger buildings and an accessible street layout. The linear character of the centre is evident, with one former street transformed into a pedestrian zone, the Marble Promenade. Streets in this area have gentle slopes, even paving in good condition, and systematic maintenance, allowing outdoor access to most central attractors. A critical aspect of urban layout accessibility for wheelchair users is network connectivity and legibility. The presence of dead ends is problematic and can discourage space usage. Sokobanja is characterised by a simple layout with a linear centre surrounded by circular secondary streets, which is morphologically legible and suitable for wheelchair users. Based on the terrain slope and landmarks, it is clear whether movement is oriented toward the centre or the periphery; without maps, downhill movement naturally leads to the main attractors. A notable problem is illegal parking, which obstructs sidewalks for pedestrians and wheelchair users. Addressing this issue requires systematic parking design, public awareness, and enforcement against improper parking. Table 4 presents the synthesised accessibility of the analysed attractors.

4.2. Analysis of Attractors – Heritage and Central Activities

The central area of the settlement is represented by the Marble Promenade, as evidenced by the concentration of heritage attractors in this zone, such as Miloš's Residence, the Church of the Holy Transfiguration of the Lord, the Gallery – Heritage of Milun Mitrović, and the Homeland Museum (Figure 4). The Central City Park adjoins the Marble Promenade, forming an integrated unit, with park access available from a large section of the promenade (Fig. 5).

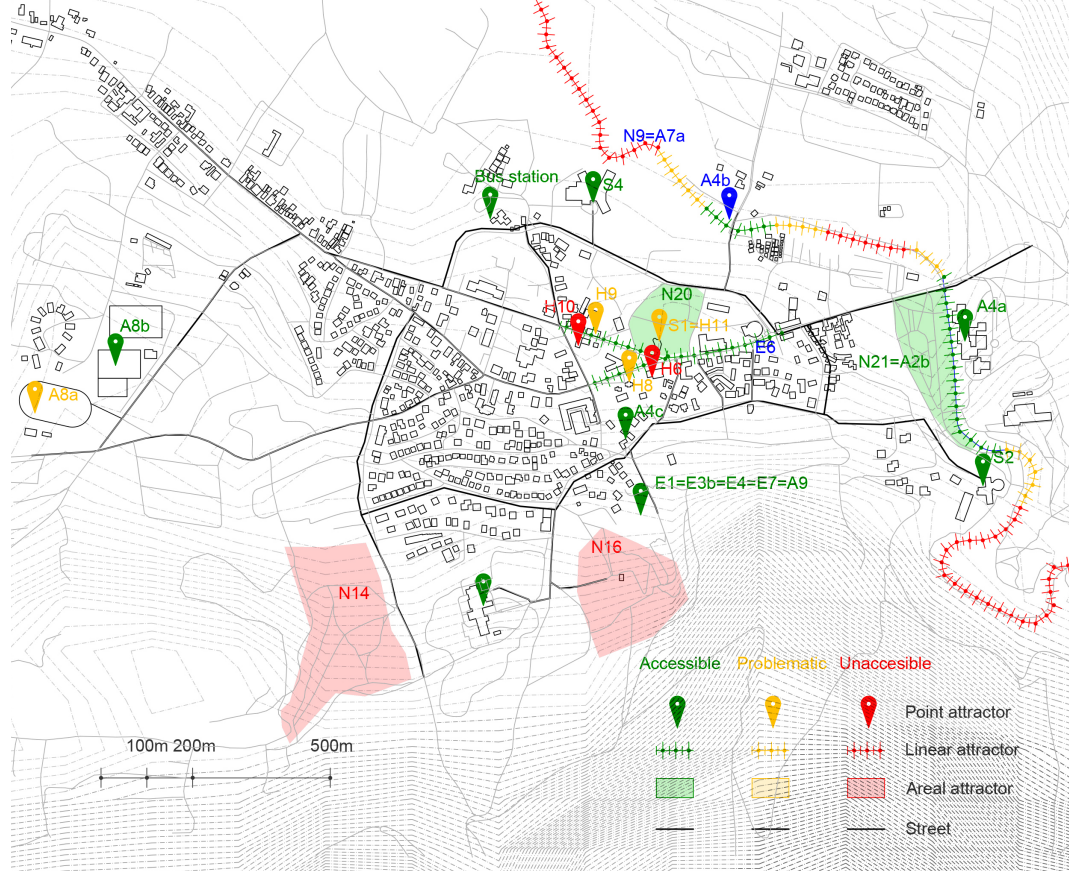


FIGURE 4. Map of the accessibility of the Attractors. Source: Author illustration

Code	Program	
N9=A7a	The Moravica River	Accessible
N14	The forest park Cuka 2	Inaccessible
N16	Picnic area Vrelo-Borici	Inaccessible
N20	Central City Park	Accessible
N21=E2b	Banjica park	Accessible
S1=H11	The Turkish bath Amam	Problematic
S2	Bath Banjica	Accessible
S4	Zdravljak	Accessible
H6	Milos's Residence	Inaccessible
H8	The Church of the Holy Transfiguration of the Lord	Problematic
H9	The gallery - heritage of Milun Mitrovic	Problematic
H10=E2a	The Homeland Museum	Inaccessible
E6	Golden hands- marble promenade	Accessible
A8a	Sports tourism- Stadium Bata Nole	Problematic
A8b	Sports tourism- Podina fields	Accessible
A9=E1=E3b=E4=E7	Summer stage Vrelo	Accessible
A4a	Hotel Sunce	Accessible
A4b	Soko Terme	Accessible
A4c	Nataly Spa	Accessible

TABLE 4 Accessibility assesment of selected attractors



FIGURE 5. The Central City Park and the Marble Promenade contact. Source: Author illustration

Along this stretch, the “Golden Hands” tourist-cultural event is organised annually. Established in 1983, the event is a competition showcasing the preparation of old, forgotten dishes and traditional crafts. Visitors have the opportunity to taste traditional Serbian dishes and purchase authentic, traditionally crafted souvenirs. Each year, over 100 participants from across Serbia take part, and more than 5,000 tourists and locals attend (TOSB, 2025m).

Regarding accessibility, this pedestrian zone is street-level, continuous, and uninterrupted (Figure 6). The street profile width allows unobstructed wheelchair movement alongside other promenade users. The smooth paving material further facilitates wheelchair use, and the quality of accessibility is reflected in the field observation of wheelchair users navigating the promenade. Some buildings along the promenade are adapted for accessibility, while others are not; however, each activity extends directly onto the promenade, making the activities along the promenade generally accessible.



FIGURE 6. Marble promenade. Source: Author illustration

The Central City Park (Figure 7) is connected to the promenade via eight access points distributed at regular intervals. Two of these accesses involve steep stairs, but due to the abundance of high-quality entrances, this is not a significant barrier. The park contains numerous benches, centennial trees providing shade, and is adorned with flowers, greenery, fountains, and sculptures. In the western part of the park is the “Sokolići” children’s playground, equipped with a variety of play structures. A stream flows through the park, fed by hot mineral water from the Turkish Bath (TOSB, 2025a). The park is fully navigable and connects the central pedestrian promenade to the outer street ring.



FIGURE 7. The Central City Park. Source: Author illustration



FIGURE 8. The Homeland Museum. Source: Author illustration

The Homeland Museum (Figure 8) is located in a 19th-century building in the centre of Sokobanja, constructed in the Serbian Moravian style. With minor reconstruction, it has preserved its original appearance. The collection includes archaeological, ethnological, and historical artefacts from the Roman period to the contemporary era (TOSB, 2025l). Access to this building is highly problematic, meaning significant interventions would be needed. The ground level is arranged in an amphitheatre form, with many steps leading to the building entrance.

The Turkish Bath “Amam”, (Figure 9) located in the central park, was built by the Turks on the foundations of Roman thermal baths in the 15th century. It was first renovated in 1834 by the order of Prince Miloš Obrenović, and most recently in 2005. It is the only operational Turkish Bath in Serbia and is known for a scene filmed in the movie *Zona Zamfirova* by director Zdravko Šotra (TOSB, 2025k).

FIGURE 9. The Turkish bath Amam.
Source: Author illustration



The Bath is accessible but is marked as problematic due to the steep slope, stone material, and lack of railing. Adapting heritage buildings poses a complex challenge, requiring a balance between accessibility and preserving historical characteristics.

Miloš's Residence (Figure 10), situated on the Marble Promenade, was built by Prince Miloš Obrenović in the first half of the 19th century for administrative purposes. The building consists of two parts: the upper floor and part of the ground floor serve as a restaurant, while the other ground-level areas accommodate additional facilities (TOSB, 2025). This attractor is marked as problematic, as adapting it would compromise its historical and ambient characteristics. Moreover, the historical quality has already been affected by multicoloured advertisements and tourist-oriented services. The Gallery – Heritage of Milun Mitrović (Figure 11) opened on June 21, 2001, at the initiative of Sokobanja's academic painter Milun Mitrović, who donated over 150 paintings. The gallery hosts various exhibitions and literary events throughout the year (TOSB, 2025d). Accessibility to this building is relatively straightforward from the main promenade; however, the entrance area features three steps without a ramp, marking it as problematic. The gallery's contents can also be appreciated externally.



FIGURE 10. Milos's Residence. Source: Author illustration



FIGURE 11. The gallery - heritage of Milun Mitrović. Source: Author illustration



FIGURE 12. The Church of the Holy Transfiguration of the Lord. Source: Author illustration

The Church of the Holy Transfiguration of the Lord (Figure 12), located in central Sokobanja, was built in 1892 in the Serbian-Byzantine style by Italian craftsmen, based on the design of architect Svetozar Ivacković. Serbian Metropolitan Mihailo, a native of Sokobanja, funded the project. Alongside the church, the Metropolitan built a primary school (1894) and established the first ecological society in 1895, named the “Society for the Improvement and Beautification of Sokobanja and its Surroundings.” (TOSB, 2025b) The church is fully accessible to wheelchair users; however, it is marked as problematic for several reasons. The main entrance connected to the pedestrian promenade has three steps, followed by a narrow doorway and a steep ramp without a railing. Nonetheless, an alternative ramped entrance for wheelchairs exists, providing direct access to the church. Although accessible, the lack of clear wayfinding may discourage use of the space, making it problematic.

4.3. Analysis of Attractors – Nature

The primary analysis was conducted based on Tables 1, 2, and 3. From the content provided on the Sokobanja Tourist Organisation website, it can be concluded that most natural attractors are located more than 2 kilometres away, which would require the use of a car to reach them. From the perspective of accessibility for people with disabilities, these attractions are considered inaccessible, as they cannot be reached without a vehicle. This category includes mountain peaks, lakes, caves, and some picnic areas. Natural attractors located closer to the settlement include parks, picnic areas, the Moravica River, and springs. A joint analysis of the maps and tables reveals patterns between the type of content, spatial characteristics, and physical location of the attractors. Attractors involving nature are generally spatially expansive, meaning they lack clear focal points and instead encourage movement through the space. Nature can be experienced in two ways: observing from a distance or spending



FIGURE 13. Special Hospital “Sokobanja”. Source: Author illustration



FIGURE 14. Picnic area Vrelo-Borici. Source: Author illustration

time within it. Near the Special Hospital Sokobanja (Figure 13), there are Cuka 2 Park and Picnic Area Vrelo-Borici. Vrelo-Borici, located approximately 300 m from the centre, was once a fashionable excursion site frequented by famous writers, actors, artists, politicians, and members of the Karadorđević royal family. A path connects it with the Borići picnic area, which is equipped with benches, tables, and play equipment. This makes it suitable for children and adults with respiratory problems due to the high concentration of negative ions in the air (Figure 14). The site also contains a commemorative fountain dedicated to Hajduk Veljko Petrović and a multifunctional complex, the “Vrelo” Summer Stage (TOSB, 2025c). Cuka 2 Park Forest is located in the Cuka neighbourhood, near the Special Hospital. It features evergreen forest, a health path, children’s playground, wooden benches, and pavilions. The space is suitable for various sports activities such as badminton and frisbee, as well as walks and day-long outdoor stays in a beautiful natural environment (TOSB, 2025h). Both of these attractors are marked as inaccessible for wheelchair users, due to the absence of pedestrian paths through them. While access from the street allows for viewing the nature within these areas, the steep slopes and lack of navigable paths discourage active engagement.



FIGURE 15. Summer stage “Vrelo”. Source: Author illustration

The “Vrelo” Summer Stage (Figure 15) is a multifunctional facility completed in early 2020. It includes a Main Stage capable of hosting concerts, musical-theatrical performances, festivals, and other events for up to 1,500 seated and 3,000 standing attendees, while a smaller stage surrounded by a water feature hosts smaller-scale events (TOSB, 2025e). “Vrelo” Summer Stage is used as part of the Banja Summer Entertainment Program, including Sokobanja Summer, St. John Celebrations, Green Heart Fest, and First Accordion of Serbia.

Zdravljak Spring, located at the Zdravljak Hotel, is fully accessible (Figure 16). The entrance is in the middle of the terraces, with no steps or barriers, and lower-level facilities are connected via a ramped approach. Banjica Park (Figure 17), situated in the broader center along the Moravica River, is approximately 500 m from the Marble Promenade. The park is well-maintained, featuring benches, flowers, greenery, and an outdoor gym and running tracks made of tartan. The park houses the Banjica Bath, which features thermal mineral water up to 28°C and is used for treating various neurological conditions, as well as the Čoka Restaurant by the river (TOSB, 2025g). The Moravica River, 60.4 km long, is a right tributary of the South Morava River, originating at the foot of Devica Mountain. The river is rich in white fish species such as barbel, chub, gibel carp, and trout. Tributaries are clear mountain streams that are home to river crayfish (TOSB, 2025i). The river is accessible only to people with disabilities in the Banjica Park area. Two additional access points exist, but these sections are undeveloped and lack high-quality natural surroundings. The river, park, and steep hills together form an ambient unit perceived as a linear attractor, fully accessible along its length and area. Sports facilities are located on the settlement’s periphery at the Podina Sports Complex (Figure 18) and Bata Nole Stadium (Figure 19). The Podina Complex, suitable for athlete training, matches, and sports events, covers 4 ha and includes six football fields, locker rooms, showers, and a modern gym accessible to athletes, residents, and tourists (TOSB, 2025j). The Podina fields are level with pedestrian paths, with no significant elevation changes or stands. Bata Nole Stadium is accessed from street level, though the approach is currently neglected.



FIGURE 16. Zdravljak Hotel.
Source: Author illustration.



UPPER FIGURE. FIGURE 17.
Banjica park. Source: Author
illustration



RIGHT FIGURE. FIGURE 18.
"Podina" Fields. Source:
Author illustration



FIGURE 19. Stadium "Bata Nole".
Source: Author illustration

5. CONCLUSION

The conducted research demonstrates that the spatial organisation of Sokobanja Spa partially aligns with the needs of wheelchair users and the principles of inclusive design. The central promenade and adjacent public areas, such as the Central City Park, represent relatively accessible spaces, while peripheral zones and natural or heritage sites show significant spatial discontinuities. These discontinuities arise from steep terrain, inadequate infrastructure, and the architectural characteristics of protected buildings, which limit the ability to adapt entrances and circulation routes without compromising heritage integrity.

Mapping proved to be an effective methodological tool for identifying the relationships between accessibility, spatial morphology, and assistive technology use. It provided a visual and analytical framework for recognising patterns of inclusion and exclusion within the built environment. The results indicate that accessibility in spa settlements cannot be improved solely through technical adaptations, but requires an integrated approach that connects spatial planning, infrastructure development, and cultural heritage management.

The findings may serve as a reference for local authorities in prioritising accessibility improvements and developing a digital database of accessible tourist attractions. The methodological approach can be replicated in other spa settlements in Serbia where similar terrain and heritage conditions exist. Finally, the research reaffirms the importance of aligning the physical environment with assistive technologies to achieve genuine spatial inclusion and ensure the full participation of people with disabilities in tourism and everyday life.

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