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Pristupačnost Zagreba za korisnike motornih invalidskih kolica

Accessibility in Zagreb for power wheelchair users

Nepristupačnost gradskoga okoliša za osobe s invaliditetom jedna je od bitnih dimenzija njihove društvene diskriminacije. Ovaj rad istražuje fizičke prepreke s kojima se susreću korisnici motornih invalidskih kolica prilikom kretanja Zagrebom, u dijelovima gradskih četvrti Gornji grad – Medveščak, Donji grad i Trnje, ukupne površine 4,31 km^2. U istraživanju je primijenjen participativni pristup pa su korisnici invalidskih kolica bili uključeni u terensko istraživanje tijekom kojega je procjenjivana prohodnost uličnih segmenata te su vrednovane i kartirane prepreke koje otežavaju ili onemogućuju kretanje. Na osnovi istraživanja izrađene su karte pristupačnosti te mrežno postavljena odgovarajuća interaktivna GIS karta. Rezultati su pokazali da u istraženom području osobe u motornim invalidskim kolicima ne mogu samostalno prijeći čak 22 % ukupne duljine pločnika i 16 % pješačkih prijelaza, a za svladavanje 19 % duljine pločnika i 9 % pješačkih prijelaza potrebna im je pomoć više od jedne osobe. Najčešće su prepreke neadekvatni pločnici, rubnjaci te stube.

Ključne riječi: pristupačnost, korisnici motornih invalidskih kolica, Zagreb, prepreke kretanju

The urban environment's inaccessibility to persons with disabilities is one of the crucial aspects of social discrimination. The paper explores the physical barriers that power wheelchair users encounter while moving around Zagreb, specifically in parts of the following neighbourhoods: Gornji grad (Upper Town) – Medveščak; Donji grad (Lower Town); and Trnje. The aforementioned neighbourhoods encompass a total surface area of 4.31 km^2. A participatory approach was applied in the research, whereby wheelchair users were included in the part of the research where navigability of the streets was assessed and the barriers which made moving difficult or impossible were also assessed and mapped. Based on the conducted research, accessibility maps were created and a corresponding interactive GIS map was uploaded online. The results showed that, in the researched areas, power wheelchair users were not able to navigate 22% of total pavement length and 16% of pedestrian crossings by themselves; and they required the assistance of more than one person in order to navigate 19% of pavement length and 9% of pedestrian crossings. The most common barriers include inadequate pavements, kerbs and stairs.

Key words: accessibility, power wheelchair users, Zagreb, barriers to mobility

Teorijski kontekst i ciljevi instraživanja

Ravnopravan pristup svih pojedinaca sadržajima i infrastrukturi urbanih i ruralnih naselja, njihovu izgrađenom okolišu, prijevozu i komunikacijama te drugim uslugama namijenjenima ili otvorenima javnosti izrazit je pokazatelj inkluzivnosti društva. Stupanj pristupačnosti naselja bitno određuje mobilnost njegovih stanovnika, odnosno mjeru slobode njihova kretanja. S obzirom na to da je mobilnost važna sastavnica kvalitete života (Hanson i Pratt, 1995), nejednakost u stupnju mobilnosti možemo smatrati izrazom društvene nejednakosti ili, štoviše, jednim od društveno-institucionalnih mehanizama reprodukcije društvene nejednakosti (Imrie, 1996a). Stoga ne začuđuje da se unutar geografije, discipline za koju je mobilnost, odnosno pokretljivost jedan od temeljnih pojmova (Cresswell, 2006), bavljenje osobama s invaliditetom, dakle osobama sa znatno reduciranom pokretljivošću, velikim dijelom odvija preko rasprave o pitanjima nejednakosti, dominacije i marginaliziranosti.

Od 1990-ih godina, u koje možemo smjestiti početak geografije invaliditeta kao subdiscipline, napisan je znatan broj znanstvenih radova vezanih uz probleme s kojima se osobe s invaliditetom susreću i uz diskriminirajuće strukture i prakse koje te probleme proizvode (vidi npr. Imrie, 1996a; 1996b; 1999; Butler i Bowlby, 1997; Kitchin, 1998; Parr i Butler, 1999; Gleeson, 1999a; 1999b; Valentine, 1999). Osobita je pažnja pri tome bila posvećena praksi uređenja suvremenih gradova i hendikepirajućem učinku te prakse na osobe s invaliditetom (v. osobito Imrie, 1996a).

U skladu s tom tradicijom i ovaj rad polazi od stava da je nepristupačnost gradskoga okoliša za osobe s invaliditetom jedna od bitnih dimenzija njihove društvene diskriminacije. Ovdje prezentirano istraživanje provedeno je u Zagrebu, a u njegovu su fokusu aspekti fizičkoga uređenja grada koji ne odgovaraju potrebama za mobilnošću osoba s invaliditetom, konkretno – korisnicima motornih invalidskih kolica. U radu će se prikazati prepreke u gradskom okolišu s kojima se korisnici invalidskih kolica suočavaju, tj. evidentirat će se elementi materijalnoga uređenja Zagreba koji ograničavaju njihovu mobilnost.

Theoretical context and research goals

Provisions of equal access to facilities and urban and rural community infrastructure, the constructed environment, transport and communication, as well as other services intended for or open to the public are significant indicators of a society's level of inclusivity. The degree to which a neighbourhood is accessible impacts its inhabitants' mobility to a great extent, in other words it determines how free they are to move about. In view of the fact that mobility constitutes an important component of the quality of life (Hanson and Pratt, 1995), inequality on the level of mobility can be considered a reflection of social inequality or indeed of the socio-institutional mechanisms that generate social inequality (Imrie, 1996a). Therefore, it comes as no surprise that geography, a discipline that includes mobility among its basic concepts (Cresswell, 2006), deals with persons with disabilities, i.e. persons with restricted mobility, largely by discussing the issues of inequality, domination, and marginalisation.

Since the 1990s, when the geography of disability emerged as a sub-discipline, a considerable number of research papers have been written discussing problems that persons with disabilities encounter as well as discriminatory structures and practices which cause these problems (cf. Imrie, 1996a; 1996b; 1999; Butler and Bowlby, 1997; Kitchin, 1998; Parr and Butler, 1999; Gleeson, 1999a; 1999b; Valentine, 1999). Special attention has been given to urban development in modern cities and handicapping impact it has had on persons with disabilities (cf. Imrie, 1996a).

Following in this tradition, the starting point of the paper is the position that the inaccessibility of urban environments to persons with disabilities remains one of the important aspects of social discrimination. The research presented here was conducted in Zagreb and focused on different aspects of the city's urban development that are not aligned with the mobility needs of persons with disabilities, more specifically: power wheelchair users. The paper presents the barriers in the urban environment that wheelchair users encounter, i.e. it lists the elements of Zagreb's urban development that restrict their mobility.

Svakako treba istaknuti da mobilnost korisnika invalidskih kolica unutar grada ne ovisi samo o izgrađenom okolišu. Ona ovisi i o mnogim drugim čimbenicima: od osobne fizičke kondicije osobe s invaliditetom do sposobnosti društva da osigura takvom pojedincu s invaliditetom osobnoga asistenta, od (financijske) dostupnosti tehničkih pomagala do stupnja razvijenosti programa za senzibilizaciju društva, od arhitekture zgrada koja „isključuje ulazak bilo koga tko se ne može koristiti stubama i otvarati vrata rukom" (Gleeson 1999, 137) do načina javnoga prijevoza koji pretpostavlja da putnici nemaju tjelesnih oštećenja.

Imajući sve to na umu, ovaj će se rad ipak usredotočiti samo na jedan od čimbenika koji na mobilnost korisnika invalidskih kolica imaju hendikepirajući učinak – na fizičke prepreke prilikom kretanja ulicama i pločnicima grada. Naše istraživanje nije obuhvaćalo unutarnje uređenje prostora zgrada ni pristupe zgradama – ulaze i izlaze iz njih. Stoga ćemo se po uzoru na rad Vujakovića i Matthewsa (1994) koristiti terminom „makrookoliš osoba s invaliditetom" kako bismo označili okoliš u kojem se te osobe kreću gradom, odnosno prostor izvan i između zgrada.

Geografski radovi vezani uz pristupačnost urbanoga okoliša korisnicima invalidskih kolica u pravilu rezultiraju izradom karata pristupačnosti ili razradom navigacijskih modela i alata. Tako je istraživanje Matthewsa i Vujakovica (Vujakovic i Matthews, 1994; Matthews i Vujakovic, 1995) bilo popraćeno sastavljanjem karte pristupačnosti središnjega dijela grada Coventry u Ujedinjenom Kraljevstvu, a istraživanje Kitchina (2002) kartom pristupačnosti gradića Newbridge u Irskoj. I naše se istraživanje koristilo sličnim pristupom. Pritom prepreke nisu samo kartirane, nego su njihove lokacije i digitalizirane, što je omogućilo stvaranje detaljne interaktivne mrežne GIS karte pristupačnosti istraženih dijelova Zagreba.

Među dosadašnjim radovima posvećenima mobilnosti korisnika invalidskih kolica mogli bismo izdvojiti dvije skupine.

Prva skupina radova primjenjuje „preskriptivni pristup" (Han i dr., 2002). Preskriptivni pristup temelji se na procjeni usklađenosti okoliša s propisima

Also, it is important to mention that wheelchair users' mobility in the city does not depend solely on the constructed environment. There are many other factors to be taken into consideration: a given person's physical condition; society's ability to provide an assistant to each person with a disability; (financial) accessibility of technical aids; the level of development of awareness-raising programmes; construction of architecture which "excludes anyone who cannot use the stairs or use their hands to open doors" (Glesson, 1999, 137); and public transport modes that do not readily accommodate passengers with physical impairments.

Bearing all this in mind, the paper will focus on just one of the factors that has a handicapping effect on wheelchair users' mobility: physical barriers encountered when moving along city streets and pavements. Our research did not encompass the interior design of building spaces or access to buildings, i.e. entrances and exits. Therefore, following the example of Vujaković and Matthews (1994), we shall be using the expression "persons with disabilities' macro-environment" in order to denote the environment in which they move through the city, which refers to the space outside and between the buildings.

Geography papers pertaining to the accessibility of the urban environment to wheelchair users are often followed by the development of accessibility maps or further development of navigation models and tools. Subsequently, Mathews and Vujaković's research (Vujaković and Matthews, 1994; Matthews and Vujaković, 1995) resulted in the drafting of an accessibility map for central Coventry in the United Kingdom, while Kitchin's research (2002) led to the drafting of an accessibility map of the small town of Newbridge, Ireland. Our research has followed a similar approach in terms of not only mapping the barriers but also digitising their locations, which has made it possible to create a detailed interactive online GIS accessibility map of the researched parts of Zagreb.

Among the papers that have previously dealt with the wheelchair users' mobility, we were able to distinguish two groups.

In the first group the "prescriptive approach" (Han et al., 2002) was applied. Namely, this approach is based on an assessment of alignment between the en-

vezanima za pristupačnost. Naime, o preprekama kretanju osoba s invaliditetom već postoji akumulirano znanje, koje je svoj odraz dobilo i u legislativi mnogih država. U europskim su se zemljama tijekom posljednjih desetljeća pojavili propisi koji upućuju na zaokret u smjeru preuzimanja društvene odgovornosti za rješavanje pitanja mobilnosti osoba s invaliditetom. U Hrvatskoj je, na primjer, kao i u drugim zemljama Europske unije, potpisana Konvencija o pravima osoba s invaliditetom Ujedinjenih naroda te je prihvaćena legislativa kojom se nastoje prevladati diskriminirajuće prakse, među ostalim i urbanoga uređenja. Dosad su donesene tri strategije povezane s izjednačavanjem mogućnosti osoba s invaliditetom (NN 13/03, NN 63/07, NN 42/17) u kojima je istaknut i problem mobilnosti te potreba za osiguravanjem pristupačnosti javnim površinama, prometnim površinama, prijevoznim sredstvima, javnim i stambenim objektima (v. NN 13/03 čl. 2.7. i NN 42/17, članak 6.). Donesen je Pravilnik o osiguranju pristupačnosti građevina osobama s invaliditetom i smanjene pokretljivosti (NN 78/13) koji uz propisivanje uvjeta i načina osiguravanja pristupačnosti u građevinama određuje i standarde pristupačnosti u prostorima i površinama javne namjene – uključujući parkirališta, javne pješačke površine, pješačke prijelaze.

Upravo zakonom propisani tehnički standardi u osnovi su preskriptivnoga pristupa proučavanju mobilnosti ljudi s invaliditetom. Naime, istraživanja koja se koriste tim pristupom uglavnom uključuju evaluaciju okoliša na osnovi propisanih parametara. Takav su pristup npr. primijenili Kasemsuppakorn, Karimi i Tajgardoon (Kasemsuppakorn i Karimi, 2009; Tajgardoon i Karimi, 2015) čija su se istraživanja temeljila na bazama podataka koje su sadržavale informacije o stupnju usklađenosti elemenata fizičkoga okoliša s propisanim standardima pristupačnosti.

Druga skupina radova primjenjuje „participativni pristup" (Kitchin, 2002). Ako se preskriptivni pristup temelji na procjeni pristupačnosti od strane istraživača, tj. „eksperata", participativni se pristup koristi iskustvima i znanjima samih osoba s invaliditetom i pretpostavlja njihovu stručnost da sami procijene u kojoj su im mjeri pristupačni elementi okoliša. Primjenom participativnoga pristupa proučavanju mobilnosti ljudi s invaliditetom. Naime, istraživanja koja se koriste tim pristupom uglavnom uključuju evaluaciju okoliša na osnovi propisanih parametara. Takav su pristup npr. primijenili Kasemsuppakorn, Karimi i Tajgardoon (Kasemsuppakorn i Karimi, 2009; Tajgardoon i Karimi, 2015) čija su se istraživanja temeljila na bazama podataka koje su sadržavale informacije o stupnju usklađenosti elemenata fizičkoga okoliša s propisanim standardima pristupačnosti.

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vironment and accessibility regulations. Consequently, there is a lot of accumulated knowledge on barriers to persons with disabilities' mobility, which is reflected in the legislation of numerous states. In European countries in recent decades we have seen regulations which indicate that there has been a turn in terms of social responsibility, i.e. in terms of resolving mobility issues that persons with disabilities are faced with. Croatia, for example, like many other EU member states, is a signatory to the United Nations Convention on the Rights of Persons with Disabilities. As a result of the aforementioned membership, legislation was adopted in order to overcome discriminatory practices caused by urban development. So far three strategies related to equal treatment of persons with disabilities (OG 13/03, OG 63/07, OG 42/17) that emphasise the mobility issue and the need to provide access to public areas, transport areas, means of transport, and to buildings—both public and residential (see OG 13/03 art. 2.7 and OG 42/17, art. 6). The Ordinance on Ensuring Access to Construction Works for Disabled Persons and Persons with Reduced Mobility (OG 78/13) was adopted, which not only regulates the conditions and ways of ensuring access to buildings but also prescribes the accessibility standards in spaces and areas for public use—including car parks, public pedestrian areas, pedestrian crossings.

It is the legally binding technical standards, per se, that provide the basis for the prescriptive approach to studying persons with disabilities' mobility. To be exact, the research applying this approach mostly includes evaluation of the environment based on prescribed parameters. Such an approach was taken by Kasemsuppakorn, Karimi, and Tajgardoon (Kasemsuppakorn and Karimi, 2009; Tajgardoon and Karimi, 2015), whose research relied on database information regarding the extent to which the physical environment was aligned with prescribed accessibility standards.

The other group of papers applied the "participatory approach" (Kitchin, 2002). While the prescriptive approach is based on the accessibility assessment made by the researchers, i.e. "experts", the participatory approach uses experiences and knowledge regarding persons with disabilities themselves and assumes that they have enough expertise to judge for themselves the degree to which certain elements of the environment are accessible.

pativnoga pristupa istraživači „daju glas" osobama s invaliditetom i njima prepuštaju procjenu pristupačnosti okoliša utemeljenu na stvarnim iskustvima.

Participativni je pristup bio korišten u nizu dosadašnjih istraživanja pristupačnosti okoliša za osobe u invalidskim kolicima. Kitchin (2002) je primijenio, čini se, najinkluzivniju metodologiju, uključivši korisnike invalidskih kolica u sve faze istraživanja (osim tehničke faze izrade karata pristupačnosti). U nizu drugih studija osobe u kolicima bile su uključene u istraživanje u početnim fazama, tj. tijekom evidentiranja i procjene (ne)premostivosti pojedinih prepreka: stuba i stubišta, rubnjaka, hrapavih površina, nagiba ceste, uskih pločnika i sl. (Vujakovic i Matthews, 1994; Matthews i Vujakovic, 1995; Matthews i dr., 2002; Meyers i dr., 2002; Beale i dr., 2006; Kasemsuppakorn i dr., 2015) ili u završnim fazama – kad se testirala izrađena interaktivna karta pristupačnosti (Beale i dr., 2006).

I u našem se radu primjenjuje participativni pristup. Pri tome podržavamo stav Vujakovica i Matthewsa (1994, 359): kada geografi i kartografi preuzimaju na sebe izradu karata pristupačnosti bez suradnje s osobama s invaliditetom, oni ugrađuju u te karte vlastite slike prostora, a ne viđenje prostora potencijalnih korisnika tih karata. Stoga smo, ocjenjujući stupanj pristupačnosti Zagreba, nastojali što više uzeti u obzir iskustva i procjene ljudi koji se gradom kreću u invalidskim kolicima. Prvo, korisnici kolica bili su aktivni sudionici dviju radionica na kojima su se donosile važne metodološke odluke, uključujući i odluku o tome koje će se prepreke i barijere kretanju istraživati. Drugo, osobe u kolicima sudjelovale su u terenskom istraživanju tijekom kojega su te prepreke i barijere vrednovane i kartirane. Po tome je naše istraživanje metodološki slično istraživanju Vujakovica i Matthewsa (1994) te Kitchina (2002). Međutim, za razliku od rada Kitchina, u našoj smo studiji ocjenjivali ne samo pojedinačne prepreke nego i cijele segmente ulica, a za razliku od istraživanja Vujakovica i Matthewsa, u kojem su istraživači prohodnost uličnih segmenata računali na osnovi podataka o preprekama dobivenim od osoba s invaliditetom, mi smo samim korisnicima kolica prepustili i ocjenu prohodnosti uličnih segmenata (kao i ocjenu pojedinih prepreka).

By using the participatory approach the researchers allow persons with disabilities to have a voice and are letting them make their own assessments of how accessible their environment is to them, based on their actual experiences.

The participatory approach has been used in numerous papers on environment accessibility for persons in wheelchairs. It appears that Kitchin (2002) used the most inclusive methodology by involving the wheelchair users in all stages of the research (except the technical stage of drawing the accessibility maps). In a number of other studies wheelchair users were involved either in the initial phases, i.e. during the process of recording the barrier (im)passability assessment: stairs and staircases; kerbs; rough surfaces; road inclines; narrow pavements etc. (Vujaković and Matthews, 1994; Matthews and Vujaković, 1995; Matthews et al., 2002; Meyers et al., 2002; Beale et al., 2006; Kasemsuppakorn, Karimi and Ojeda, 2015), or in the final stages when the created interactive accessibility map was being tested (Beale et al., 2006).

We applied the participatory approach in our work. We concur with Vujaković and Matthews (1994, 359) in their view that when geographers and cartographers take it upon themselves to draw the accessibility maps without cooperating with persons with disabilities, they incorporate their own concepts of space into them and not the concept of space that the potential users of the maps might have. Therefore, in assessing the degree to which Zagreb is accessible, we tried our best to take into account the experiences and assessments of the people who actually move about the city in wheelchairs. First, wheelchair users actively participated in two workshops where they were involved in making important methodological decisions, including the decision regarding which obstacles and barriers to mobility were going to be researched. Second, wheelchair users participated in the field research, during which the obstacles and barriers in question were evaluated and mapped. In this way, our research is methodologically similar to the research of Vujaković and Matthews (1994) and Kitchin (2002). However, in contrast to Kitchin's work, we assessed not only individual obstacles but also entire street segments; and in contrast to Vujaković and Matthews' research, where researchers calculated street segment accessibility based on data on obstacles received from persons with disabilities, we asked wheelchair users to assess the accessibility of street segments (and to give their assessment of each obstacle therein).

Za razliku od prethodnih radova u kojima se ocjenjivala i kartirala pristupačnost manjih područja grada, u našem je radu istraživanjem obuhvaćeno područje ukupne površine od 4,31 km^2, što nam je omogućilo da donesemo zaključke o stupnju heterogenosti grada s obzirom na pristupačnost te pretpostavimo uzroke te heterogenosti.

Metodologija i tijek istraživanja

Ljudska mobilnost u velikoj se mjeri određuje raspoloživim osjetilima i alatima. Raznovrsne alate kojima se koristimo pri kretanju određuje vještina i raznovrsnost prostornih praksi potrebnih za snalaženje. Noge, oči, proteza, bijeli štap, invalidska kolica, bicikl, automobil, avion – sva ta oruđa, organska i anorganska, određuju karakter naše mobilnosti i prostornoga iskustva (Šakaja, 2018). Za osobu s invaliditetom pomagalo za kretanje jest produžetak tijela koji zajedno s tijelom čini jedinstven kompozitni entitet, utječe na način orijentacije i kretanja, na način označavanja i konceptualizacije prostora (Lefebvre, 1991; Simonen, 2005; Simonen, 2007). I invalidska kolica možemo smatrati dijelom „proširenoga tijela" njihovih korisnika, koje sada, u toj kompozitnoj formi, sudjeluje u trijadi *tijelo – prostorna praksa – okoliš*. Utoliko kolica, kao pomoćni alat, velikim dijelom određuju i svakodnevne prakse osoba s invaliditetom i način njihove konceptualizacije okoliša. Mnogo pritom ovisi i o tipu kolica kojim se pojedinac koristi. Ranija istraživanja (Matthews i dr., 2002; Beale i dr., 2006) pokazala su da se prepreke poput uskih pločnika, rampi, podignutih poklopaca šahtova i dr. u različitoj mjeri doživljavaju kao smetnja, ovisno o tome kakva se kolica koriste – ručno upravljana ili motorna. Stoga u ovom istraživanju nismo uopćavali iskustva korisnika različitih tipova kolica, nego smo pristupačnost Zagreba analizirali samo za skupinu korisnika motornih kolica. Tu smo skupinu odabrali iz dvaju razloga. Prvo, svrha analize pristupačnosti jest poticanje samostalnoga kretanja u gradu, a upravo motorna kolica to najviše omogućuju. Jedan je od sudionika istraživanja (A. K.) svoj izbor motornih kolica obrazložio ovako: „ne mora vas netko drugi nositi, voziti, vući". Drugo, motornim je kolicima,

In contrast to the previous papers which assessed and mapped the accessibility of smaller city areas, the research in our paper encompassed the total surface area of 4.31 km^2, which enabled us to make the conclusions on the degree of heterogeneity concerning the city's accessibility and to infer its causes.

Methodology and research process

Human mobility is largely measured by the senses and tools that are available to us. In moving we use different tools which are determined by our practiced spatial skills, which are necessary for navigation. All the tools we use—legs, eyes, prosthetics, canes, wheelchairs, bicycles, cars, airplanes—whether organic or inorganic, determine the character of our mobility and spatial experience (Šakaja, 2018). In the case of a person with a disability, the aid they use in order to move represents an extension of their body that, together with their body, makes a unique composite entity that influences the way they move and orient themselves, as well as the way in which they designate and conceptualise space (Lefebvre, 1991; Simonen 2005; Simonen, 2007). The wheelchair itself can be considered a part of the "extended body" of its user, which participates, in its composite form, in the *body – spatial practice – environment* triad. Therefore, as an aid, the wheelchair determines the everyday practices of persons with disability and the way they conceptualise the environment to a great extent. That is to say, a lot depends on the type of wheelchair that a person uses. Earlier research (Matthews et al., 2002; Beale et al., 2006) has shown that depending on the type of wheelchair used—manual or powered—barriers including narrow pavements, ramps, upturned manhole covers, etc. are experienced as hindrances to varying extents. Hence, not wishing to generalise the experiences of users of different types of wheelchairs, we analysed Zagreb's accessibility only for the group of power wheelchair users. There are two reasons why we chose this group. First and foremost, the purpose of accessibility analysis is to encourage independence in moving around the city, and power wheelchairs facilitate this to the greatest extent. One of the research participants (A. K.) explains his choice of power wheelchair in the following way: "you don't need to be carried, driven, or dragged by somebody else". Secondly,

s obzirom na njihovu težinu i širinu, za kretanje potrebno više prostora i ravnija površina. Stoga se podatci o pristupačnosti za motorna kolica u većoj mjeri mogu primijeniti na pristupačnost za manualna kolica nego obrnuto.

Dio Zagreba koji je bio obuhvaćen istraživanjem uključio je dijelove gradskih četvrti Gornji grad – Medveščak, Donji grad i Trnje. U njega su ušli dijelom ili u cjelini mjesni odbori Gornji grad, August Cesarec, Nova Ves, Ribnjak, Mimara, Cvjetni trg, Kralj Petar Svačić, Zrinjevac, August Šenoa, Martinovka, Vrbik, Cvjetnica, Miramare, Cvjetno naselje, Savski kuti i Veslačko naselje. Dakle, odabrani su kako sam uži centar grada tako i dio grada s visokom koncentracijom visokoškolskih obrazovnih ustanova. Kako se radi o području intenzivne društvene interakcije, upravo se analiza njegove pristupačnosti nametnula kao logičan izbor. Odabrano područje morfološki je heterogeno, što je posljedica njegove izgradnje u različitim povijesnim razdobljima. Istraživanje upravo tako heterogena područja s različitim urbanim strukturama, od modificiranih srednjovjekovnih do novonastalih industrijskih i postindustrijskih, bilo je poseban izazov te je omogućilo da se izvuku zaključci o razlozima prostorne diferenciranosti grada s gledišta pristupačnosti.

Istraživanje se sastojalo od nekoliko faza.

U prvoj je fazi održana radionica na kojoj je sudjelovalo osmero studenata geografije i osmero studenata drugih studija – korisnika motornih invalidskih kolica. Svi su studenti bili s viših godina studija Sveučilišta u Zagrebu. Tijekom diskusije osobe s invaliditetom bile su poticane da podijele svoja iskustva o pristupačnosti Zagreba te da nabroje i opišu fizičke prepreke s kojima se suočavaju tijekom samostalnoga kretanja po gradu. Rasprava je snimljena i transkribirana, a transkript je kodiran i analiziran. Utoliko je radionica istodobno imala i obilježja fokus-grupe. Tokom radionice bio je sastavljen popis prepreka i smetnji (stube, visoki rubnjaci, neravnine na površini tla, nedovoljna širina pločnika, prevelik nagib pločnika, zakrčenost pločnika) i usuglašen je način evidentiranja, kartiranja i evaluacije tih prepreka i smetnji na terenu.

due to their weight and width, power wheelchairs need more space and flatter surfaces to move on. Therefore, the data on accessibility for power wheelchairs can be more readily extrapolated to accessibility for manual wheelchairs than vice versa.

The researched part of Zagreb encompassed parts of the following neighbourhoods: Gornji grad—Medveščak; Donji grad; and Trnje. It included (partially or entirely) the city councils of Gornji grad, August Cesarec, Nova Ves, Ribnjak, Mimara, Cvjetni trg, King Petar Svačić, Zrinjevac, August Šenoa, Martinovka, Vrbik, Cvjetnica, Miramare, Cvjetno naselje, Savski kuti, and Veslačko naselje. Furthermore, one part of the chosen area covered the city centre and the other was an area with a large concentration of higher education institutions. These being areas characterised by intense social interaction, they seemed to be logical choices from the point of view of analysing accessibility. The chosen area is morphologically heterogeneous, which is the consequence of its construction having taken place during different historical periods. Researching such a heterogeneous areas containing different urban structures, from modified Medieval to recently-constructed industrial and post-industrial structures, was a special challenge, nonetheless it enabled us to also draw conclusions regarding the reasons underpinning the spatial differentiation of the city from the perspective of accessibility.

The research consisted of several stages.

In the first stage a workshop was organised with the participation of eight geography students (who were not power wheelchair users), and eight students from other study programs who were power wheelchair users. All students were in the third and fourth years of their undergraduate studies at the University of Zagreb. During our discussions, persons with disability were encouraged to share their experiences with accessibility in Zagreb and to list and describe the physical barriers that they typically encountered while moving around the city independently. The discussion was recorded and transcribed, and the transcript was subsequently coded and analysed. As a result, the workshop had a focus group function in certain aspects. During the course of the workshop, a list of barriers and obstacles was compiled (stairs, high kerbs, uneven surfaces, insufficient pavement width, pavements with a (too) steep gradient, pavement congestion) and the methods of recording, mapping and evaluation of the barriers and obstacles in the field were agreed upon.

Sastavljeno je osam istraživačkih timova kojima je određen dio grada za kartiranje. U svakom je timu bila jedna osoba s invaliditetom i jedan student/studentica geografije. Sudjelovanjem u radionici studenti geografije upoznali su se s problemima mobilnosti osoba s invaliditetom, što im je olakšalo kasniji terenski rad. Pritom je osobito koristan bio zadatak kartiranja ruta (sl. 1). Kao i Vujakovic i Matthews (1994), zamolili smo sudionike radionice da na listu papira nacrtaju rutu kojom obično idu od točke A do točke B. Na slici 1 prikazane su generalizirane rute studenata geografije i studenata s invaliditetom.[1] Kao što vidimo, studenti s invaliditetom trebaju prijeći otprilike duplo veću udaljenost kako bi došli od Trga bana Josipa Jelačića do crkve sv. Marka (1075 m naspram 570 m), od Studentskoga centra do Fakulteta elektrotehnike i računarstva (1305 m naspram 670 m) ili od Filozofskoga fakulteta do Nacionalne i sveučilišne knjižnice (1277 m naspram 637 m). Za dolazak od Nacionalne i sveučilišne knjižnice do Tomislavova trga korisnici kolica prolaze za 45 % dulji put (1552 m naspram 1063 m). Razlog su duljih ruta stube, neravnine pločnika, kosine, visoki rubnjaci koje su korisnici kolica trebali zaobilaziti. Na kartama se dobro vidi nemogućnost korištenja prečica, uskih nepopločenih putića pri kretanju u kolicima, na koju se duhovito osvrnuo jedan od sudionika radionice (A. T.): „Morate se ponašati kao uglomat".

Druga faza istraživanja sastojala se od terenskoga rada. Svaka je skupina dobila popis segmenata ulica unutar područja koje je trebala kartirati. Kartirali su se pločnici s obiju strana svake ulice (npr. Veslačka ulica od broja 2 do broja 6 – istočna strana; Lomnička ulica od broja 5 do broja 25 – zapadna strana itd.). Na svakom su segmentu evidentirane pojedinačne prepreke ili smetnje, a zatim je evaluiran i cijeli zadani segment. Cilj kartiranja bio je evidentirati (upisom u tablicu, zabilježbom na karti i fotografijom) sljedeće prepreke ili smetnje kretanju po pločnicima: stube, visoke rubnjake, neravnine na površini tla, nedovoljnu širinu pločnika, prevelik

1 Plavom bojom prikazane su generalizirane karte studenata geografije A.P. (a), D. S. (b), Ž. G., M. Kov., P. M., L. D., A. H. (c), M. Kov., A. P. (d). Crvenom bojom prikazane su generalizirane karte korisnika invalidskih kolica N. T. (a), A. L. (b), N. Z., A. T., M. Kot., A. K. (c), N.T., M. Kot. (d).

We organised eight research teams and each was given a specific part of town to map. There was one person with a disability and one geography student per team. By taking part in the workshop, geography students became acquainted with the mobility problems that persons with disability have, which made their subsequent field work easier. In this respect, the task of mapping routes was especially useful (Fig. 1). Similar to Vujaković and Matthews (1994), we asked workshop participants to draw the route they usually used to go from point A to point B on a piece of paper. Figure 1 shows generalised routes for geography students and students with disabilities[1]. This showed that students with disabilities needed to cover approximately double the distance in order to get from Ban Josip Jelačić Square to St. Mark's Church (1075 m compared to 570 m), from the Student Centre to the Faculty of Electrical Engineering and Computing (1305 m compared to 670 m) or from the Faculty of Humanities and Social Sciences to the National and University Library (1277 m compared to 637 m). In order to get from the National and University Library to King Tomislav Square wheelchair users covered a 45% longer distance (1552 m compared to 1063 m). The reasons for these longer routes include stairs, uneven pavements, slopes, and high kerbs that wheelchair users need to circumnavigate. The maps clearly show that using shortcuts and narrow unpaved paths is not possible if you are in a wheelchair. As one of the workshop participants (A. T.) jokingly put it: "You need to act as if you are a *corner cutter machine*".

The second stage of the research consisted of field work. Each team was given a list of street segments within the given area to map. They mapped pavements on each side of every street (e.g. Veslačka Street from no. 2 to no. 6—east side; Lomnička Street from no. 5 to no. 25—west side, etc.). Individual barriers or obstacles were recorded in each segment and then the whole segment was evaluated. The objective was to record (by way of entering data into a table, indicating on a map, or using photography) the following barriers or obstacles to moving on the pavement: stairs; high kerbs, uneven surfaces, insufficient pavement width; pavements with a (too)

1 Generalised maps for geography students A.P. (A), D.S. (B), Ž. G., M. Kov., P. M., L. D., A. H. (C), M. Kov., A. P.(D) are shown in blue. Generalised maps of wheelchair users N. T. (A), A. L. (B), N. Z., A. T., M. Kot., A. K. (C), N.T., M. Kot.(D) are shown in red.

nagib pločnika, zakrčenost pločnika. Za evaluaciju je određen sljedeći bodovni sustav:

1 – za prepreku ili smetnju koja otežava kretanje, ali se ipak može kretati samostalno iako s poteškoćama

2 – za prepreku ili smetnju čije svladavanje zahtijeva pomoć jedne osobe

3 – za prepreku ili smetnju koja se ne može svladati uz pomoć samo jedne osobe.

Po istom bodovnom sustavu iskustveno se na terenu ocjenjivao svaki segment pločnika (1 – segment se može proći samostalno iako s mo-

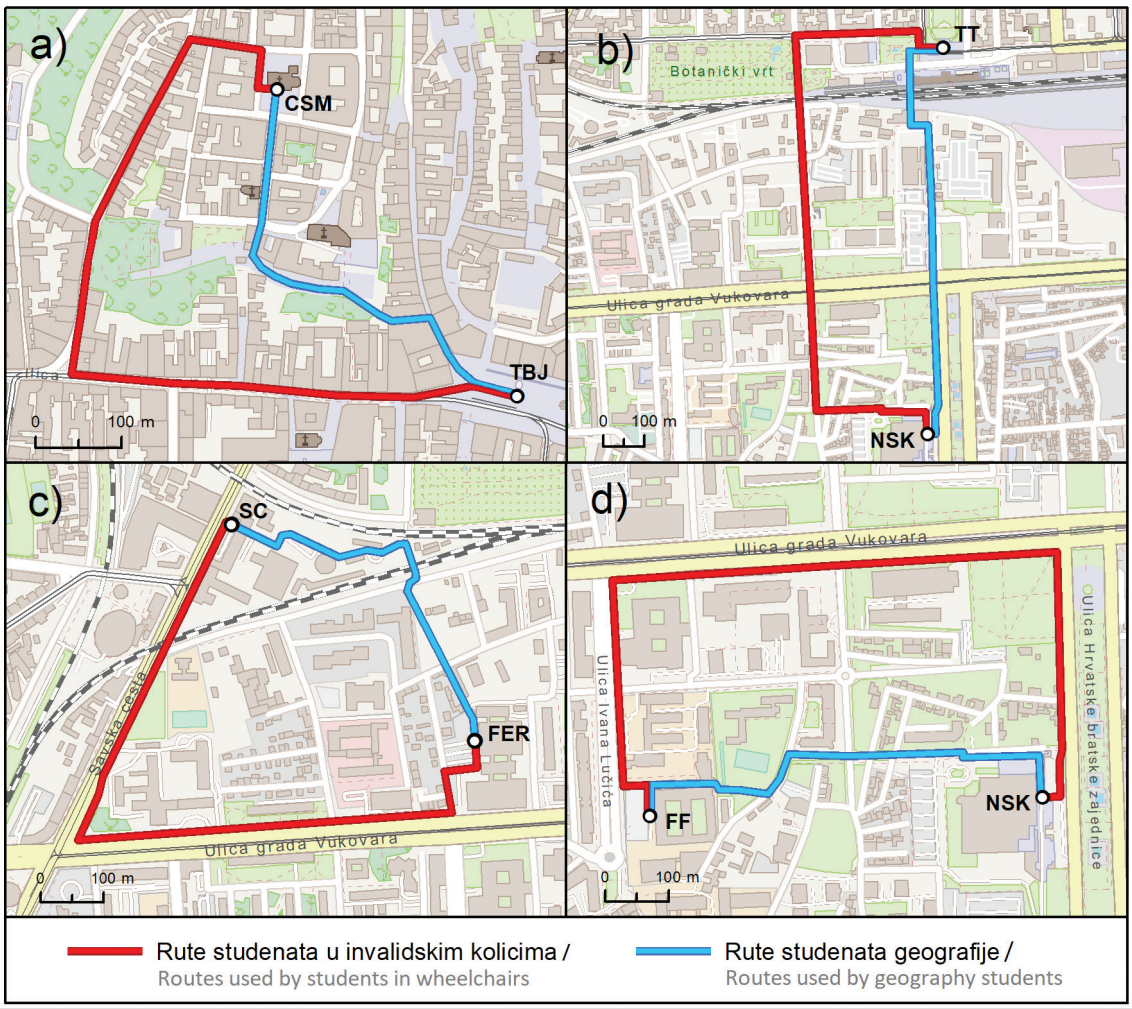
steep gradient; and pavement congestion. The following score system was set up for the evaluation:

1 – barrier or obstacle that makes movement difficult; it can be overcome but with difficulties:

2 – barrier or obstacle that requires the help of one person to overcome;

3 – barrier or obstacle that cannot be overcome with the help of only one person.

The similar score system was used experientially in the field to assess each pavement segment (1—a segment that can be passed through independently, but



Sl. 1. Generalizirane rute sudionika radionice
Fig. 1 General routes for workshop participants

Izvor: radionica održana u rujnu 2017.
Source: Workshop held in September 2017

gućim poteškoćama; 2 – segment se može proći samo uz pomoć jedne osobe; 3 – segment se ne može proći, tj. ne može se proći uz pomoć samo jedne osobe; 4 – ulice s malim prometom bez pločnika).

Nakon završenoga kartiranja održana je druga radionica (također snimljena i transkribirana) na kojoj su bili prezentirani i raspravljeni rezultati dobiveni na terenu i evidentirani elementi nekonzistentnosti u pristupu različitih timova

with possible difficulties; 2—a segment that can be passed through with the help of one person; 3—a segment that cannot be passed through, i.e. it cannot be overcome with the help of only one person; 4—streets with low traffic volume that lack pavements).

After the mapping was completed, another workshop was organised (which was also recorded and transcribed) where the results from the field were presented and discussed, wherein the inconsistencies in the approach, applied by different teams to

Tab. 1. Duljina i udio neprohodnih i teško prohodnih pločnika
Tab. 1 Length and share of pavements that are impassable or passable with a lot of difficulty

Kartirani dijelovi grada prema mjesnim odborima / Mapped parts of the city according to city councils	**Ukupna duljina kartiranih pločnika (m)** / Total length of mapped pavements (m)	**Neprohodni pločnici*** / Impassable pavements*		**Neprohodni* i teško prohodni pločnici**** / Pavements that are impassable* or passable with a lot of difficulty**		**Ulice s malim prometom bez pločnika***** / Streets with low traffic without pavements***	
		Duljina (m) / Length (m)	Udio u ukupnoj duljini kartiranih pločnika (%) / Share in total length of mapped pavements (%)	Duljina (m) / Length (m)	Udio u ukupnoj duljini kartiranih pločnika (%) / Share in total length of mapped pavements (%)	Duljina (m) / Length (m)	Udio u ukupnoj duljini kartiranih pločnika (%) / Share in total length of mapped pavements (%)
Gornji grad	22957,32	3853,74	17	4594,44	20	379,13	2
Donji grad	27492,90	768,55	3	1330,14	5	0,00	0
Martinovka	15311,75	3735,14	24	4024,75	26	1542,87	10
Vrbik, Cvjetnica, Miramare	28059,50	7395,39	26	8204,04	29	3269,49	12
Cvjetno naselje, Savski kuti, Veslačko naselje	25213,32	6285,18	25	7682,48	30	3437,45	14
Ukupno Total	119034,79	22038,00	19	25835,85	22	8628,94	7

Napomena:
* Prepreke ili smetnje na pločniku nije moguće svladati samostalno ili uz pomoć samo jedne osobe.
** Za prevladavanje prepreka ili smetnji na pločniku potrebna je pomoć jedne osobe.
*** Ulice nemaju pločnika, ali se po kolniku može relativno sigurno kretati.

Note:
* The barriers or obstacles in the pavements cannot be overcome independently or with the help of only one person.
** Overcoming barriers or obstacles in the pavement requires the assistance of one person
*** Streets have no pavements but moving on the street itself is relatively safe

Izvor: terensko kartiranje provedeno u razdoblju 1. 10. – 31. 11. 2017. i 1. 6. – 1. 7. 2018.
Source: Mapping in the field conducted from 1/10–31/11/2017 and 1/6–1/7/2018

istim situacijama na terenu. Radilo se ponajprije o različitoj evaluaciji ulica bez pločnika. Sve evidentirane nekonzistentnosti bile su ujednačene u terenskoj reviziji u kojoj je sudjelovao samo jedan tim. Uz ispravljanje uočenih pogrešaka tijekom terenske revizije istraživački tim zabilježio je koordinate svih prepreka i smetnji, što je omogućilo izradu elektroničke karte koja nije bila planirana otpočetka. Elektronička karta, opskrbljena fotografijama kartiranih prepreka, postavljena je na stranici: https://www.zagreb-access-map.com/ (tab. 1).

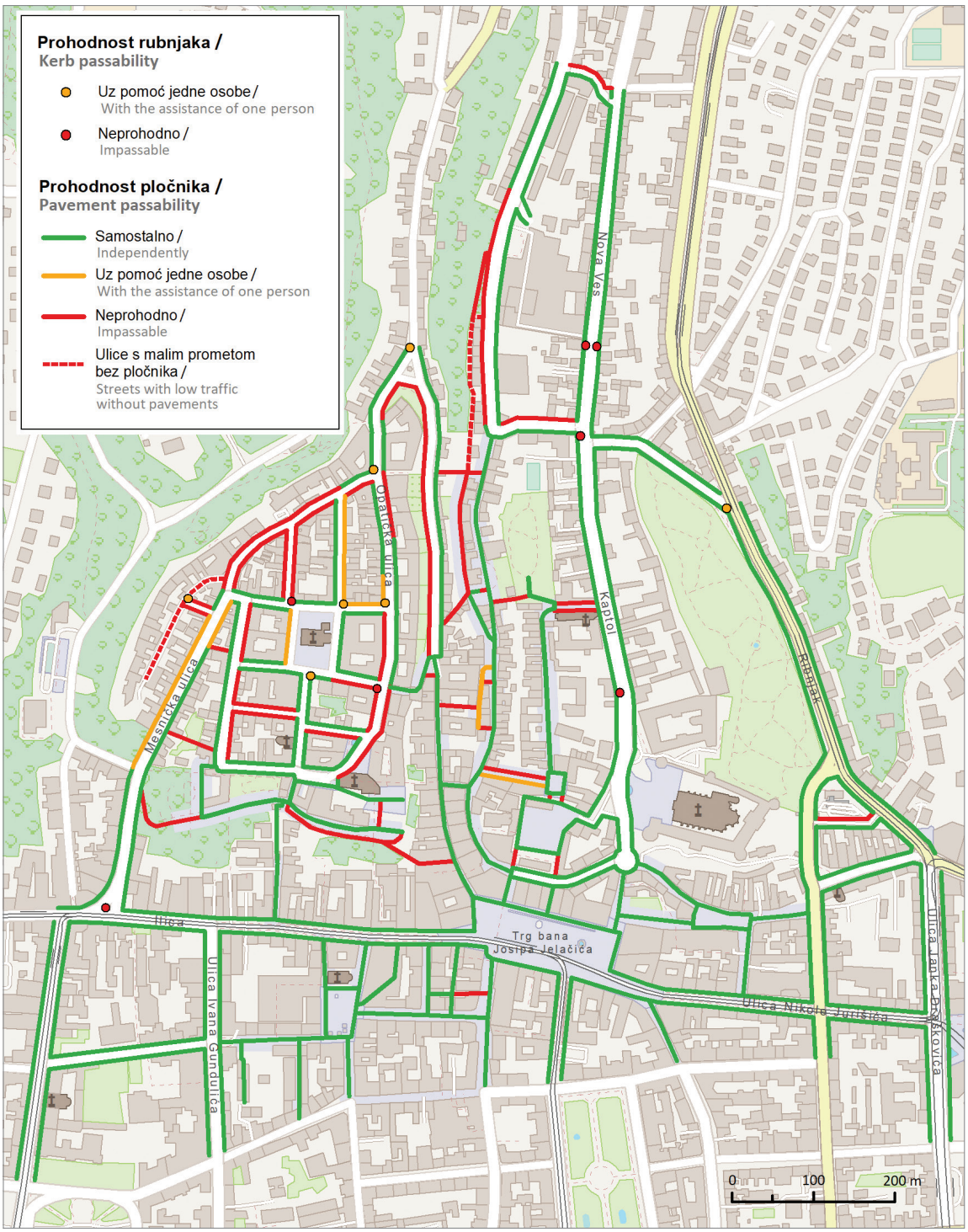
Prepreke i smetnje mobilnosti korisnika motornih invalidskih kolica

U kojoj mjeri materijalni elementi krajolika omogućuju korisnicima motornih invalidskih kolica pristup prostoru i sadržajima grada? Kao što vidimo iz nalaza istraživanja, mobilnost takvih osoba u Zagrebu je limitirana (sl. 2-6). U istraženom dijelu grada – od Zvjezdarnice do Save i od Savske do Draškovićeve ulice i Ulice hrvatske bratske zajednice – osobe u motornim invalidskim kolicima ne mogu prevladati samostalno čak 22 % ukupne duljine pločnika, a 19 % te duljine ne mogu prevladati ni uz pomoć jedne osobe, bez obzira na činjenicu što se koriste pomagalom namijenjenim autonomnom kretanju. I prelazak ceste za njih je često izazov. Naime, 16 % pješačkih prijelaza osobe u motornim kolicima ne mogu svladati samostalno, a 9 % ne mogu svladati ni uz pomoć jedne osobe. Najčešće prepreke i smetnje pritom su nedovoljno široki ili zakrčeni pločnici, visoki ili prestrmi rubnjaci te stube. Zanimljivo je da se nagib pločnika pokazao u Zagrebu kao najmanja smetnja (tab. 2): bez obzira na reljefnu razvedenost Gornjega grada, elektromotorna kolica članova istraživačkoga tima uspjela su svladati većinu nagiba i strmina njegovih ulica.

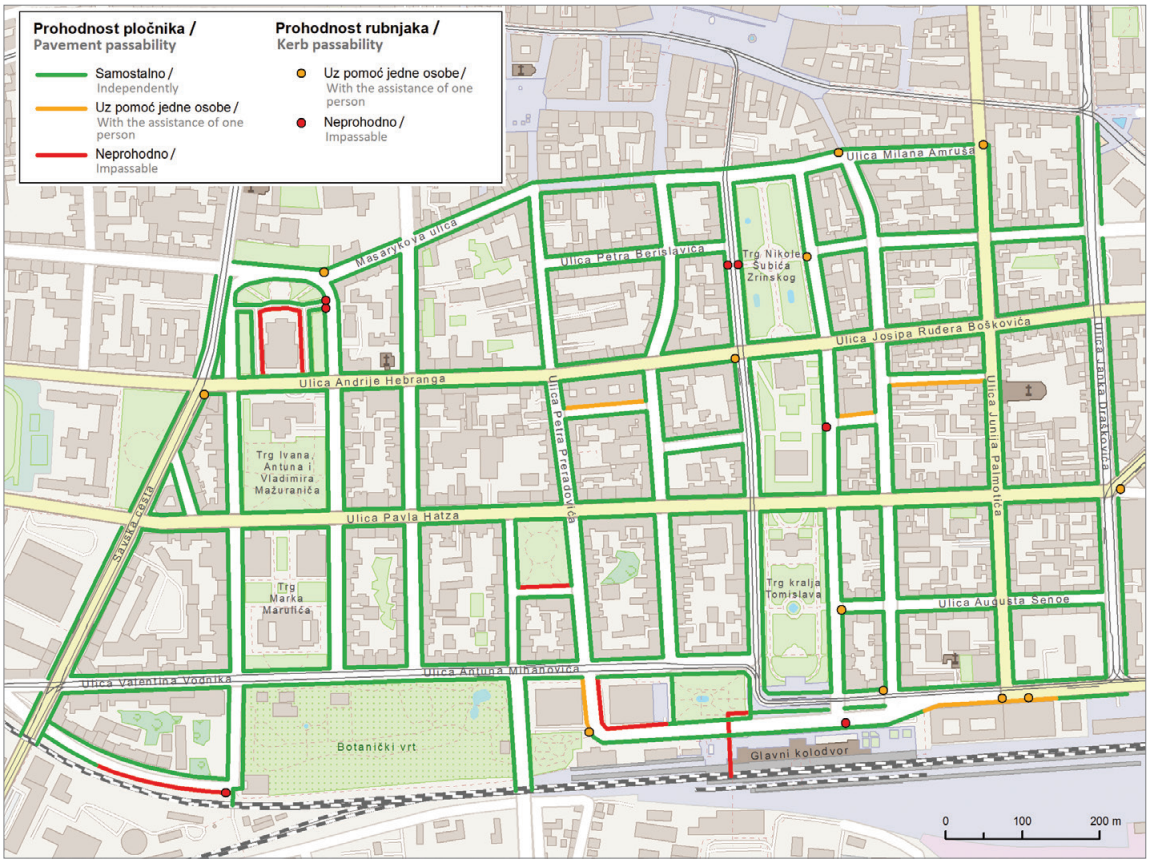
the same situations in the field, were recorded. These primarily referred to differences in the evaluation of streets without pavements. All recorded inconsistencies were aligned during revision in the field in which only one team participated. In order to correct observed errors during revision in the field, the research team recorded the coordinates for each barrier and obstacle, which made it possible to create an electronic map, which had not been planned at the beginning. The electronic map, containing photographs of the mapped barriers, was uploaded at: https://www.zagreb-access-map.com/ (Tab. 1).

Barriers and obstacles to power wheelchair users' mobility

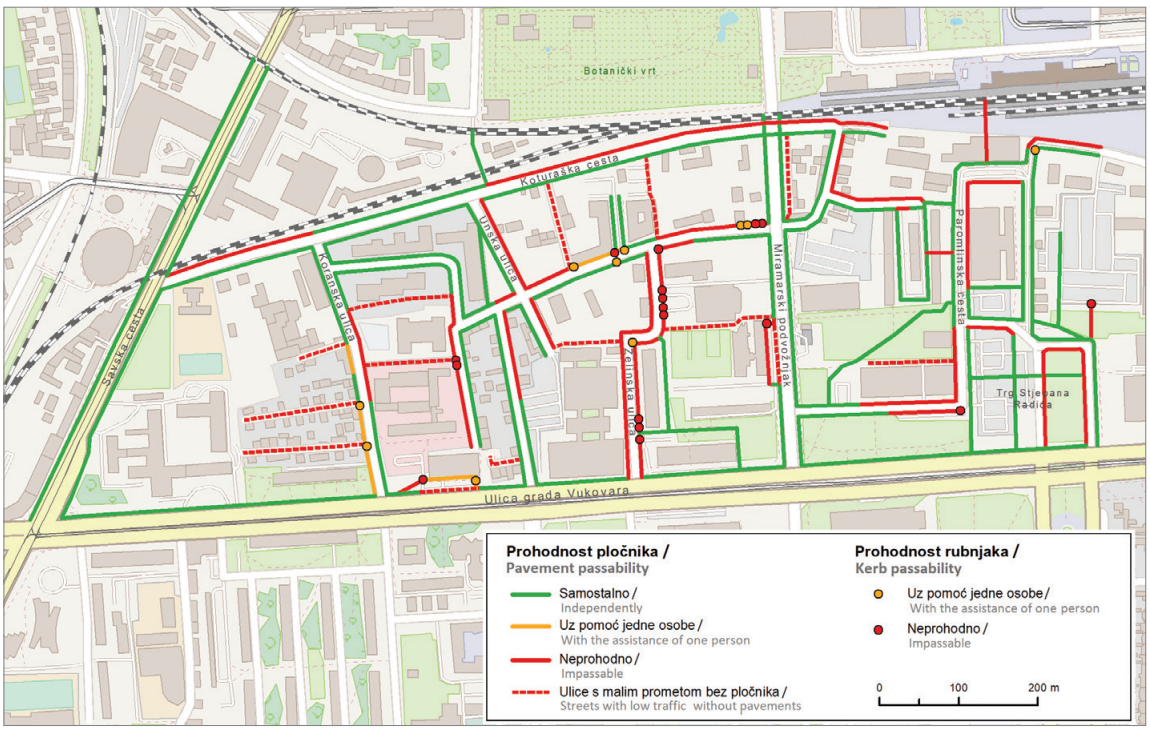
To what extent do the material elements of the landscape enable power wheelchair users to access city spaces and facilities? As can be seen from research findings, the mobility of such persons is limited in Zagreb (Fig. 2 to 6). In the researched part of the city—from the Zagreb Observatory to the Sava River and from Savska Street to Draškovićeva and Hrvatske bratske zajednice streets—persons in power wheelchairs could independently navigate only 22% of the total pavement length. Of that length, 19% could not be overcome by wheelchair users even with the help of one person, regardless of the fact that they were using an aid intended for autonomous movement. Crossing the street often proved to be challenging. Namely, persons using power wheelchairs could not cross 16% of pedestrian crossings independently, and they could not cross 9% of the crossings even with the help of one person. The most common barriers and obstacles included pavements that were not wide enough or were congested, kerbs that were high or too steep, and stairs. It is interesting to note that pavement gradient proved to be the least concerning obstacle (Tab. 2): despite the irregular relief in Gornji grad, power wheelchairs used by members of the research team managed to overcome most slopes and street gradients there.



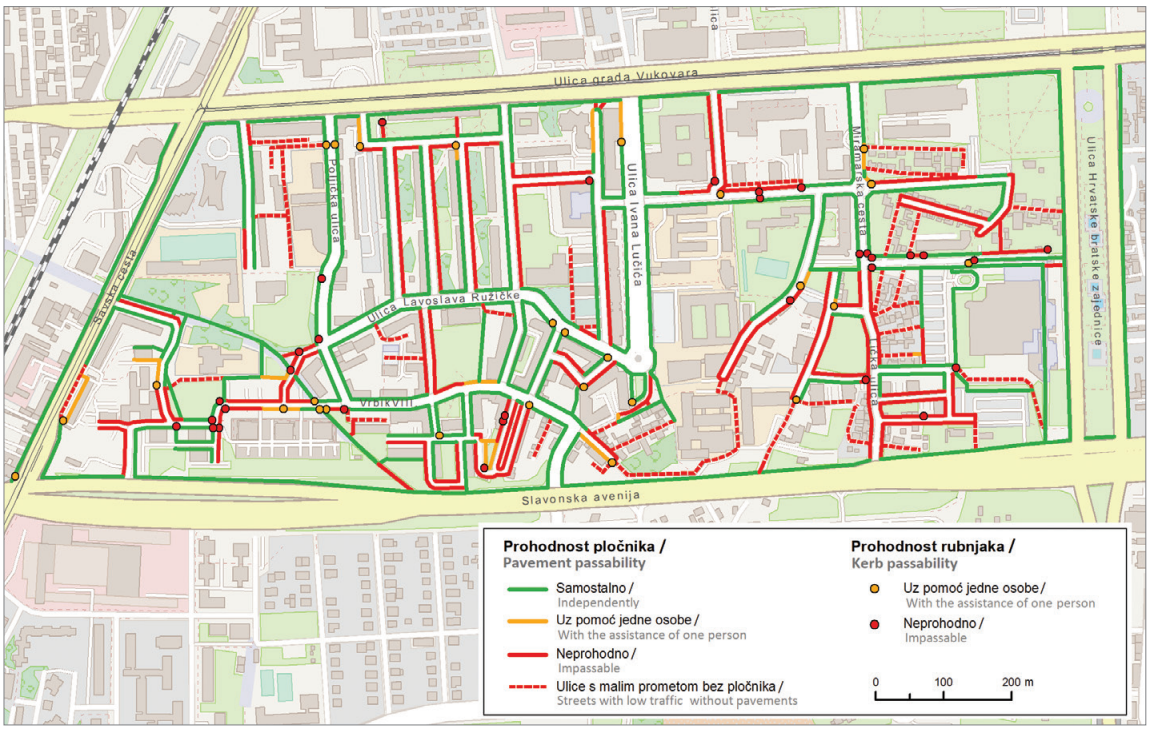
Sl. 2. Prohodnost rubnjaka i pločnika: Gornji grad
Fig. 2 Kerb and pavement passability: Gornji grad
Izvor: vlastito istraživanje / Source: own research



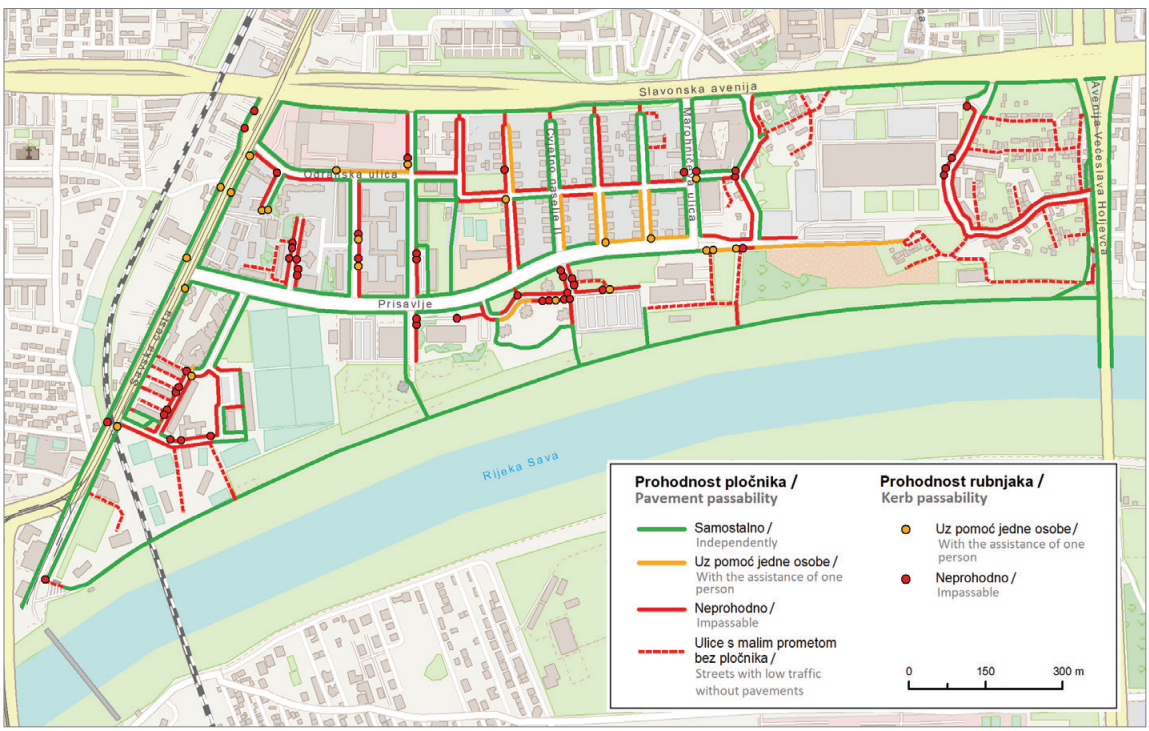
Sl. 3. Prohodnost rubnjaka i pločnika: Donji grad
Fig. 3 Kerb and pavement passability: Donji grad
Izvor: vlastito istraživanje / Source: own research



Sl. 4. Prohodnost rubnjaka i pločnika: Martinovka
Fig. 4 Kerb and pavement passability: Martinovka
Izvor: vlastito istraživanje / Source: own research



Sl. 5. Prohodnost rubnjaka i pločnika: Cvjetnica, Vrbik, Miramare
Fig. 5 Kerb and pavement passability: Cvjetnica, Vrbik, Miramare
Izvor: vlastito istraživanje / Source: own research



Sl. 6. Prohodnost rubnjaka i pločnika: Cvjetno naselje, Savski kuti, Veslačko naselje
Fig. 6 Kerb and pavement passability: Cvjetno naselje, Savski kuti, Veslačko naselje
Izvor: vlastito istraživanje / Source: own research

Tab. 2. Elementi neprohodnosti i teške prohodnosti pločnika
Tab. 2 Elements that make pavements impassable or hardly passable

Kartirani dijelovi grada prema mjesnim odborima / Mapped parts of the city according to city councils	**Udio neprohodnih* i teško prohodnih** pločnika u ukupnoj duljini kartiranih pločnika, prema preprekama i smetnjama (%)** / **Share of impassable* or hardly passable** pavements in the total length of mapped pavements according to barriers and obstacles (%)**					
	Širina pločnika / Pavement width	Stepenice / Stairs	Rubnjaci / Kerbs	Neravnine i hrapavosti tla / Uneven and rough surfaces	Nagib pločnika / Pavement gradient	Zakrčenost pločnika / Pavement congestion
Gornji grad	8	6	2	1	0	9
Donji grad	1	0	2	1	0	2
Martinovka	18	2	8	2	0	3
Vrbik, Cvjetnica, Miramare	19	2	6	1	0	5
Cvjetno naselje, Savski kuti, Veslačko naselje	12	3	10	1	0	11
Ukupno Total	12	3	6	1	0	6

Napomena: * Prepreka ili smetnja ne može se svladati samostalno ili uz pomoć samo jedne osobe.
** Svladavanje prepreke ili smetnje zahtijeva pomoć jedne osobe.

Note: * Barrier or obstacle cannot be overcome independently or with the assistance of only one person.
** Overcoming barrier or obstacle requires the assistance of one person

Izvor: terensko kartiranje provedeno u razdoblju 1. 10. – 31. 11. 2017. i 1. 6. – 1. 7. 2018.
Source: Mapping in the field conducted from 1/10–31/11/2017 and 1/6–1/7/2018

Uski, zakrčeni i neravni pločnici

Širina motornih invalidskih kolica u pravilu je veća od pola metra. Sukladno potrebama kretanja u takvim kolicima Pravilnik o osiguranju pristupačnosti građevinama osobama s invaliditetom i smanjene pokretljivosti za prolazak invalidskih kolica u javnom prostoru propisuje širinu trake kretanja od 1,20 m. Za okretanje invalidskih kolica potrebno je 1,50 m. Mnoge zagrebačke ulice s uskim pločnicima, ili bez pločnika uopće, ne zadovoljavaju takve potrebe, a zakrčeni pločnici često čine prolazak kolicima kompliciranim čak i na mjestima gdje su propisani standardi ispunjeni (sl. 7). Iz rasprava na radionici jasno vidimo probleme koje korisnicima kolica može uzrokovati zakrčenost pločnika.

Među preprekama koje otežavaju kretanje pločnicima često su se spominjali parkirani automobili. „Najgore je kad se sparkiraju na spušteni rinzol", kaže M. B. Takva situacija sprečava korisniku ko-

Narrow, congested, and uneven pavements

The width of a power wheelchair usually exceeds half a metre. In line with the requirements for mobility in this type of wheelchair, the Ordinance on Ensuring Access to Construction Works for Disabled Persons and Persons with Reduced Mobility stipulates a necessary width for wheelchair passage in public space of 1.2 m. However, in order to make a turn, such wheelchairs require 1.5 m. Many Zagreb streets with narrow pavements or without pavement do not provide for such needs, while congested pavements often make passage in wheelchairs complicated even in places where the prescribed standards have been adhered to (Fig. 7). The discussions at the workshop clearly indicated problems that wheelchair users encounter due to congested pavements.

One of the most often mentioned obstacles, which makes moving on pavements difficult, are parked cars. "Parking on low kerbs is the worst", M. B says. Such a situation prevents the wheelchair

Sl. 7. Primjer uskoga i zakrčenoga pločnika kojim je nemoguć prolazak invalidskim kolicima
Fig. 7 An example of a narrow and congested pavement , impossible to navigate in a wheelchair

Snimila /Photo by Andrijana Horvat (2018.)

lica pristup rubnjaku i prinuđuje ga na izlazak na otvorenu cestu.

„Stanu na nogostupu tako da ne možeš ni s jedne ni s druge strane, ili stanu točno di je padina da siđeš dolje na zebru, na cestu, di god. Na primjer, kod studentskog doma Stjepana Radića onako dug je nogostup i samo je na početku i na kraju rinzol, i onda dođem na kraj i vidim da je auto parkiran tako da ja ne mogu sić dolje... I onda se moram dolje vratit i onda opet ić gore – po cesti, a cesta je užasna" (N. Z.).

Prometni znakovi na pločniku, drveće i njegovo korijenje također može usporiti put odnosno produžiti putanju korisniku kolica:

user from accessing the kerb and forces them to go into the street.

"They park on the pavement so that you cannot pass on either side, or they park right on the low kerb where you need to go to get to the zebra crossing, or the road, or wherever. For example, near the Stjepan Radić Student Dorm, there is a long pavement which has a low kerb where it starts and ends, but only when I get to the end do I see that there is a car parked in such a way that prevents me from crossing... And then I have to go all the way back and go up again—on the road, and the road is horrible" (N. Z.).

Traffic signs and tree roots on pavements can also slow down or lengthen the route for a wheelchair user:

„Imate pun Rudeš znakova nasred pločnika. I sad ga vi ne možete zaobić, nego morate opet se vratiti." (N. T.).

Širinu raspoložive trake kretanja smanjuju i šahtovi, izrovani, neočišćeni nogostupi.

„Kad idem od Cvjetnog (Studentski dom „Cvjetno naselje") prema Knežiji gore po Zagrebačkoj, ima dijelova gdje je šaht baš ... previše gore nekako. I onako dva za redom. Ako idem na lijevu stranu od toga, kud bih trebala ić, pad je i onda me vuče u travu. I što onda? Moram ići na biciklističku stazu" (N. Z.).

„Staklo je ozbiljan problem. Zato što nam se buše gume na kolicima" (N. T.).

Problem mogu biti i privremeni radovi na cesti. „Vi se vozite i odjedanput, ne znam… striček postavlja, ne znam, struju, ali nije zakrpao rupu. I ne možete vi proć tu, morate se vratit" (N. T.).

Pristup s pločnika tramvaju poseban je problem jer mogućnost korištenja tramvajskoga prijevoza znatno utječe na mobilnost osoba s invaliditetom. Stoga smo tijekom istraživanja, iskustveno, uz pomoć korisnika invalidskih kolica provjerili stupanj pristupačnosti tramvajskih postaja. Utvrđeno je da je od 51 postaje koja se nalazi na istraživanom području osobama u motornim kolicima za ulazak u tramvaj na 33 postaje potrebna pomoć barem jedne osobe, a na preostalih 18 postaja ni takva pomoć nije dovoljna. Dakle, zbog prevelika razmaka između ruba pločnika na postaji i tramvaja ni na jednoj tramvajskoj postaji osoba u kolicima ne može samostalno ući čak ni u niskopodni tramvaj, već mora potražiti pomoć jedne ili više osoba. Putovanje tramvajem korisnicima invalidskih kolica otežava i činjenica da se na dolazak niskopodnoga tramvaja nekad čeka dugo. Na primjer, od tramvaja koji prometuju Ulicom grada Vukovara niskopodni su tramvaji u vrijeme istraživanja činili samo 10 %.

"Rudeš is chock-full of traffic signs put up in the middle of the pavement. You cannot go around them and have to go back again" (N. T.).

The width of the pedestrian lane can also be reduced due to manhole covers or bumpy and cluttered pavements.

"When I go from Cvjetno (the Cvjetno naselje Student Dorm) towards Knežija, using Zagrebačka Avenue, there are parts where the manhole cover is... too high somehow. And then there are two of them in a row. If a go left, where I should go, there's a drop and I get pulled into the grass. So what am I to do? I have to go on the cycling path" (N. Z.).

"Glass fragments are a serious problem, because they can cause punctures on wheelchair tyres" (N. T.).

Temporary road works can also be a problem. "You ride along and suddenly, I don't know... the workman, who was, say, laying down electricity cables, forgot to fill in the hole. So you can't pass there and you must go back" (N. T.).

Accessing trams from the pavement is a particular problem, because the tram is the most important means of public transport (in Zagreb), and the ability to use trams has a significant impact on persons with disabilities' mobility. That is why during the research we enlisted the help of the wheelchair users in order to conduct an empirical verification of the extent to which the tram stations were accessible. It was established that, in the researched area, in order to get on a tram, persons using power wheelchairs needed the assistance of at least one person at 33 out of 51 tram stations, and even such assistance was not sufficient at the remaining 18 stations. Consequently, due to too wide a space left between the pavement kerb at the station and the tram, none of the tram stations provided a person in a wheelchair with the possibility of entering the tram independently, not even in the case of low-floor trams. In order to get on the tram they needed to ask one or more persons for help. Travelling by tram in a wheelchair was made even more difficult due to long waits for the low-floor trams. For example, at the time of our research, out of all the trams operating along Vukovarska Street, the low-floor variety accounted for only 10%.

Rubnjaci

Premalo prilagođenih rubnjaka može korisnicima kolica produžiti put i vrijeme potrebno za nj. „Ponekad ćemo se mi 200 metara gore ili dolje voziti da nađemo (spušteni) rinzol, da pređemo cestu. To je naša sudbina ponekad" (M. B.) (sl. 8).

„U svom kvartu, moram otić na jedan prijelaz koju mogu savladati, a koji mi je dalje" (A. K.).

„Na Maksimirskoj, tamo prema Dubravi, ako idete lijevom stranom, morate otić ono … do okretišta busa, da biste se onda vratili drugom stranom pa prema Krašu. Nevjerojatno, ne? To je gubljenje vremena" (N. T.).

Nepostojanje spuštenih rubnjaka potiče korisnike kolica na rizične pothvate: „Pod normalno vozim po cesti, nemam druge", rekao je N. T.

I spušteni rubnjaci mogu činiti probleme kad su postavljeni samo s jedne strane pločnika.

„Najapsurdnije mi je kada su rinzoli na početku (pločnika) prilagođeni, a onda nisu. Na kraju nisu spušteni... Možemo samo doć na pločnik, ali sić ne možemo… To je taj apsurd" (M. K.).

„Ako odlazim s Jaruna prema domu, onda se mogu spustiti s pločnika, ali se ne mogu dić" (A. K.).

Izazovni za korisnike kolica mogu biti i prestrmi rubnjaci koji se, u pravilu, izbjegavaju. Na primjer, o jednom takvom rubnjaku na križanju Strossmayerova trga i Hebrangove ulice A. K. je rekao:

„Uvijek ga nastojim izbjeći. Jedino, ne znam da l' sam se kroz njega svega par puta u životu spustio kad sam baš negdje žurio, pa onda, ajde, riskiraš. Bacaš se. Al' inače ga izbjegavam".

I prestrme padine pred rubnjakom mogu biti izazov za kretanje.

„Kad, recimo, idete prema semaforu i onda, recimo, ona padina prije rinzola bude stvarno strma... I onda te povuče. Recimo, ima kod Mimare, kad se ide prema Savi, baš jedan jako nezgodan. Ja stanem, recimo, prije tog, ili kad i dođem na taj rinzol, onda se cijelo vrijeme ovako lagano s *joystickom* nazad, da me on održava na toj padini" (A. K.).

Kerbs

Too few adjusted kerbs can prolong journeys for wheelchair users and the time needed to make them. "Sometimes we need to go 200 m up or down to find a (dropped) kerb, to cross the road. That is our destiny at times" (M. B.) (Fig. 8).

"In my neighbourhood I need to go to the one crossing that I can use, and that one is farther away" (A. K.).

"On Maksimirska (street), going towards Dubrava, if you take the left side, you need to go... to the bus terminal, in order to come back along the other side towards Kraš. Unbelievable, isn't it? It's a waste of time" (N. T.).

The lack of inclined kerbs encourages wheelchair users to take risks: "I regularly use the road, I have no alternative," says N. T.

Even inclined kerbs can cause problems, when they are available on only one side of the pavement.

"For me, the most absurd thing is when the kerbs are inclined at the beginning (of the pavement) and not after that. At the end they are not inclined... We can only come up onto the pavement but we cannot go down... That's the absurdity of it" (M. K.).

"If I'm going home from Jarun, then I can come down from the pavement, but I cannot get up onto it" (A. K.).

Inclined kerbs that are too steep can also be challenging for wheelchair users, and as a rule, they are avoided. For example, this is what A. K. has said about one such kerb at the intersection of Strossmayer Square and Hebrang Street:

"I always try to avoid it. Apart from, I don't know, maybe a few times in my life, when I was really in a hurry, and then you say ok and take the risk. You take the plunge. But otherwise, I avoid it".

The slopes that are too steep before a kerb can also be a challenge when moving.

"For example, you are on your way to the traffic lights, and the slope before the kerb is really steep... and it pulls you down. Say, near Mimara, in the direction of Sava (Student Dorm), there is a very tricky one like that. I stop, say, before it, or when I come up on the kerb, I keep slightly pulling my joystick back the whole time, so that I can stay on the slope" (A. K.).

Sl. 8. Primjer otežana prolaska invalidskim kolicima zbog neprilagođenoga rubnjaka
Fig. 8 An example of unadjusted kerb, difficult to pass in wheelchairs

Snimila /Photo by Andrijana Horvat (2018.)

Kao osobito problematični spominjali su se i rubnjaci na pješačkim otocima ili tramvajskim postajama.

„Otoci nekad nemaju spuštenog rinzola. Vi se spustite na stanicu, ali vi ne možete nikud dalje, znači opet morate nekoga moliti da vam pomogne da se vi s tog otoka spustite i da nastavite dalje preko ceste, po zebri... Znači moram nekog moliti da me spusti s tramvaja i još da me spusti s tog otoka da bih uopće mogao ići preko ceste" (A. K).

Other very challenging examples included kerbs on refuge islands (when a tram station is in the middle of the street rather than on the side) or at other tram stations.

"Sometimes refuge islands don't have inclined kerbs. So you get to the station, but you're trapped there, which means you have to ask somebody to help you get down from the island and continue to cross the road or zebra... It means I have to ask somebody to help me down from the tram and on top of that, to help me down from the island so that I can cross the road at all" (A. K.).

Stube i stubišta

Iako su se stube rjeđe navodile kao prepreka, na nekim rutama one mogu znatno produžiti put. Dobra je ilustracija Kožarska ulica. Felbingerove stube, koje presijecaju Kožarsku ulicu, čine njezin sjeverni dio puno daljim za korisnika kolica koji, ako se kreće s juga, tom dijelu ulice može pristupiti tek ako napravi veliki luk prema sjeveru. Uloga stuba kao bitne barijere koja utječe na prostorno-

Stairs and staircases

Although stairs were not mentioned as a barrier very often, there are routes where they can lengthen the journey significantly. A good example is Kožarska Street. The Felbinger Stairway, which cuts across Kožarska Street, makes the north part of the journey much longer for a wheelchair user who, if they come from the south, can access that part of the street only provided they make a wide turn to the north. The role of stairs as an important barrier which has an

vremenska obilježja kretanja korisnika kolica dobro se vidjela i tijekom crtanja uobičajenih ruta na početnoj radionici. Na primjer, ruta od Trga bana Jelačića do Opatovine, koju prolazi student geografije A. P., bila je zbog Zakmardijevih stuba za 53 % kraća nego ruta korisnika invalidskih kolica N. T.

Zbog izrazito hendikepirajućega učinka stuba i stubišta za osobe u kolicima važna je uloga rampi namijenjenih za svladavanje te prepreke. Rampe su međutim, kako možemo iščitati iz diskusije na radionicama i iz rezultata terenskoga istraživanja, često primjer „pomagala koja to nisu". Naime, rampe s prevelikim kosinama (sl. 9), rampe za čije je korištenje potreban nedostupan ključ, nesigurne rampe, rampe koje završa-

impact on the spatial and temporal characteristics of wheelchair users' mobility could be easily seen when the usual routes were drawn at the initial workshop. For example, the route from Ban Jelačić Square to Opatovina, which geography student A. P. uses, was 53% shorter owing to the Zakmardi Stairway than the route used by N. T., a wheelchair user.

Due to the exceptionally handicapping effect that stairs and staircases have on persons in wheelchairs, it is very important to have ramps that help overcome these barriers. However, ramps are often an example of "an aid that is, in effect, a hindrance", as can be seen from the workshop discussions and the field research results. More specifically, ramps with too steep a gradient (Fig. 9), ramps that require an access key to be used, unsafe ramps, ramps

Sl. 9. Primjer rampe prestrme za prolaz invalidskim kolicima
Fig. 9 An example of ramp too steep to navigate in wheelchairs

Snimila /Photo by Andrijana Horvat (2018.)

vaju stepenicama (sl. 10), navodile su se kao primjeri „kvazi rampi"(M. K.) koje „nemaju smisla" (A. L.).

„Danas se za zgradu dobije poticaj od grada Zagreba, za rampu. I onda oni kažu – e pa mi imamo rampu. Tamo u gradskom poglavarstvu kažu – okej, vidjeli smo, aha, ima rampu, gle, stvarno rampa. A to, sad, što se nitko u kolicima ne može popet uz nju ili spustiti se, to je sad taj problem" (N. T.).

„Na primjer u Novom Zagrebu u pothodnicima postoje one rampe koje imaju ključ za koji nitko ne zna gdje je. OK, netko tko živi u tom kvartu može dobit ključ. Ali šta ako ja tamo hoću otići?" (N. Z.).

„Na tim stepenicama je... ja bih je nazvala kvazi rampa. Na njoj su dvije odvojene šipke. A prostora ima toliko između njih da ti može propasti kotač dok prođeš tu rampu… To su ti one apsurdne prilagodbe koje nisu prilagodbe" (M. K).

that end in stairs (Fig. 10), etc. are just a few examples that were mentioned as "quasi ramps" (M. K.) that "make no sense" (A. L.).

"These days a building is eligible for a subsidy from the city of Zagreb if it has a ramp. And then they say—well, we have a ramp. And in the city council says—OK, we've seen it, yes, it has a ramp. Look. There really is a ramp! But the real problem is actually the fact that nobody in a wheelchair can go up or down that ramp" (N. T.)

"For example, in Novi Zagreb there are ramps in pedestrian underpasses, but they require a key and nobody knows where to get one. OK, people who live in that neighbourhood can get a key. But what if I want to pass through?" (N. Z.).

"So these stairs have... what I would call a quasi-ramp. It has two separate bars between which there's enough space for a wheel to fall through as you're passing along the ramp... Now, those are the absurd adaptations which are not adaptations at all" (M. K.).

Sl. 10. Primjer otežana prolaska invalidskim kolicima zbog stepenice na kraju rampe
Fig. 10 An example of ramp ending in a single stair, complicated to navigate in wheelchairs
Snimila / Photo by Andrijana Horvat (2018.)

„I kad prođete tu rampu, onda su vam stepenice. Znači dođe se do vrha rampe i stepenice su. Baš je možeš proć' normalno i onda dođeš vamo, vidiš 20 stepenica, pa ti padne mrak na oči" (M. K.).

Prostorna diferenciranost u stupnju pristupačnosti

Kako je već rečeno, istraživanjem je bilo obuhvaćeno područje od 4,31 km². Podatci pokazuju da je stupanj pristupačnosti različitih dijelova Zagreba raznolik. Još tijekom rasprave na početnoj radionici/fokus-grupi korisnici invalidskih kolica izdvojili su Donji grad kao najpristupačniji dio Zagreba, Gornji grad kao područje koje „ima prolaz" (N. T.), a područja novije gradnje, uključujući i područja oko fakulteta, pokazala su se problematičnima. Zanimljivo je da je terensko istraživanje potvrdilo takve „odokativne" ocjene. Kao što vidimo na tablici 1 i na kartama 1-5, od istraženih područja najpristupačniji je Donji grad, a zatim Gornji grad. No znatno manji stupanj prohodnosti imaju dijelovi Zagreba južno od pruge. U Martinovki, naime, 26 % pločnika korisnici u invalidskim kolicima ne mogu proći samostalno, a južno od Vukovarske ulice za kretanje im je potrebna pomoć čak na 29-30 % ukupne duljine pločnika. Razlog su ponajprije uski i zakrčeni pločnici i visoki, oštećeni, strmi rubnjaci (tab. 2). Zbog takvih rubnjaka udio pješačkih prijelaza koji su neprohodni ili teško prohodni u gradskim četvrtima južno od Vukovarske ulice veći je od 20, odnosno od 30 % (tab. 3).

Manje prometne ulice bez pločnika, gdje se osoba u kolicima može relativno sigurno kretati i po kolniku, izdvojili smo u posebnu grupu. Takve su ulice koncentrirane pretežito u starim radničkim dijelovima grada koji tek čekaju urbanu rekonstrukciju (Miramare i istočni dio Cvjetnoga naselja) (tab. 2).

Ukratko, stariji dijelovi Zagreba, Donji grad i Gornji grad, kako pokazuje naše istraživanje, imaju morfologiju koja se čini prilagođenijom

"And when you pass the ramp, you come to the stairs. So basically, you reach the top of the ramp only to come to a staircase. You pass the ramp alright and you see 20 stairs in front of you, and that's when you just lose it" (M. K.).

Spatial differentiation in the degree of accessibility

As it was already mentioned, the researched covered an area of 4.31 km². The data have shown that there are differences in the degree of accessibility between different parts of Zagreb. During the discussions at the first workshop/focus group, wheelchair users emphasised that Donji grad was the most accessible part of Zagreb, while Gornji grad was described as an area with "a single passage" (N. T.). Areas that have been built more recently, including the area around University faculties, were found to be problematic. It is interesting to mention that the field research confirmed these "rough" assessments. As we can see in Table 1 as well as on maps 1-5, out of all researched areas Donji grad is the most accessible, followed by Gornji grad. However, the other researched parts of Zagreb, south of the railway tracks, have a much lower degree of navigability. In Martinovka, for example, the wheelchair users could not navigate 26% of pavements on their own, whereas south of Vukovar Street they required assistance to manoeuvre through 29-30% of the total pavement length. The main reason for this was narrow and congested pavements, as well as high, damaged and steep kerbs (Tab. 2). Due to such kerbs, the share of impassable or hardly passable pedestrian crossings in the neighbourhoods south of Vukovar Street exceeds 20% to 30% (Tab. 3).

Streets with low traffic volume, which have no pavements but provide relatively safe passage to persons in wheelchairs on the street itself, belong to a special group. Such streets are mostly concentrated in parts of the city with old workers' quarters that are waiting for urban renewal (Miramare and the eastern part of Cvjetno naselje) (Tab. 2).

To sum up, according to our research, the older parts of Zagreb, i.e. Donji grad and Gornji grad, have morphology which seems to be more adapted to

Tab. 3. Prohodnost pješačkih prijelaza
Tab. 3 Pedestrian crossings navigability

Kartirani dijelovi grada prema mjesnim odborima / **Mapped parts of the city according to city councils**	**Ukupan broj kartiranih pješačkih prijelaza** / **The total number of mapped pedestrian crossings**	**Neprohodni* pješački prijelazi** / **Impassable* pedestrian crossings**		**Neprohodni* i teško prohodni** pješački prijelazi** / **Impassable* and hardly passable** pedestrian crossings**	
		Broj / Number	Udio u ukupnoj duljini kartiranih prijelaza (%) / Share in the total number of mapped pedestrian crossings (%)	Broj / Number	Udio u ukupnoj duljini kartiranih prijelaza (%) / Share in the total number of mapped pedestrian crossings (%)
Gornji grad	96	7	7	13	13
Donji grad	216	6	3	16	7
Martinovka	81	6	7	11	14
Vrbik, Cvjetnica, Miramare	157	19	12	32	20
Cvjetno naselje, Savski kuti, Veslačko naselje	106	20	19	33	31
Ukupno Total	656	58	9	105	16

Napomena: * Pješački prijelaz nije moguće svladati samostalno ili uz pomoć samo jedne osobe.
** Za svladavanje pješačkoga prijelaza potrebna je pomoć jedne osobe.

Note: * Pedestrian crossing is impassable independently or with the help of only one person
** Negotiating the pedestrian crossing requires the assistance of one person

Izvor: terensko kartiranje provedeno u razdoblju 1. 10. – 31. 11. 2017. i 1. 6. – 1. 7. 2018.
Source: Mapping in the field conducted from 1/10–31/11/2017 and 1/6–1/7/2018

za kretanje osoba s invaliditetom nego dijelovi novije izgradnje, nastali širenjem Zagreba južno od pruge. Koliko se god to činilo naoko nelogičnim, taj nalaz lako možemo interpretirati kao odraz jedne od važnih tendencija 20. stoljeća – širenja automobilizma te s time povezane promjene kako načina života tako i načina oblikovanja grada. Širenje kolnika na račun pločnika (poput širenja parkirališta na račun igrališta) samo je jedna od posljedica toga procesa. Zanemarivanje pješaka, koje je prepoznatljivo u morfologiji dijelova Zagreba potaknutoj industrijskim i postindustrijskim razvojem grada u drugoj polovici 20. stoljeća, očito ima izravne posljedice na mogućnosti i limite kretanja osoba u invalidskim kolicima.

persons with disabilities" mobility in comparison with more recently constructed parts of the city, which were developed in order to allow Zagreb to spread south of the railway tracks. However counterintuitive it may seem at first glance, this finding can easily be interpreted as a reflection of one of the important tendencies of the 20th century—the constantly growing use of cars and the corresponding effects this has had on lifestyle and the development of cities. Widening the street at the expense of pavements (like expanding parking lots at the expense of playgrounds) is just one of the consequences of this process. The disregard for pedestrians, evident in the morphology of some parts of Zagreb, which was influenced by industrial and post-industrial development of the city in the second half of the 20th century, clearly has had direct repercussions in regard to limitations to persons in wheelchairs" mobility.

Zaključak

Primjenom participativnoga pristupa u ovom se istraživanju nastojala postići ravnoteža između sistematičnosti strogo određena istraživačkoga postupka i uvažavanja subjektivnoga iskustava osoba s invaliditetom. Zbog zasnovanosti na iskustvu samih korisnika kolica karte pristupačnosti koje se ovdje prezentiraju (sl. 2-6), a osobito interaktivna GIS karta postavljena na internet, naći će, nadamo se, primjenu u svakodnevnoj praksi osoba kojima su te karte i namijenjene – osobama koje se kreću po gradu u invalidskim kolicima. Digitalizacija i obrada u GIS-u podataka dobivenih na terenu omogućila je da procijenimo razinu pristupačnosti javnih prostora Zagreba. Evaluaciju pristupačnosti, koja je ovdje predstavljena, vidimo kao svojevrsnu podlogu za prevladavanje prepreka i smetnji mobilnosti korisnika invalidskih kolica u Zagrebu.

Istraživanje je obuhvatilo samo dio Zagreba. Za potpunu kartu Zagreba potreban je nastavak i proširivanje istraživanja te daljnje prikupljanje informacija gore opisanom metodom. S obzirom na to da je grad stalno u mijeni, omogućavanje korisnicima da unutar interaktivne karte unesu povratne informacije o preprekama i smetnjama kretanju sigurno bi pridonijelo aktualnosti informacija o pristupačnosti. Pouzdani i aktualni podatci nužan su preduvjet izradi navigacijskoga sustava u sljedećem koraku istraživanja.

Sljedeći logičan korak jest usmjeravanje korisnika na osnovi takvih činjenica. Dosadašnji rad na promišljanju najboljih načina usmjeravanja osoba u kolicima prema najpristupačnijim rutama donio je nekoliko razrađenih modela. Model MAGUS (Modelling access with GIS in Urban systems) – uz pomoć GIS-a i na osnovi izračuna posebnoga indeksa (*impedance score*) modelira razinu pristupačnosti te omogućuje korisnicima da donose informirane odluke o kretanju te stoga može služiti kao alat za usmjeravanje (Matthews i dr. 2002). Model U-Access upućuje korisnike na najkraće rute unutar kampusa, a napravljen je za tri skupine korisnika: sa samostalnom pokretljivošću, s potpomognutom pokretljivošću i za korisnike invalidskih kolica (Sobek i Miller, 2006),

Conclusion

By applying the participatory approach, the research attempted to strike a balance between a systematic, strictly-defined research process and taking the subjective experience of persons with disabilities into account. Since they are based on the experiences of the wheelchair users themselves, hopefully the accessibility maps presented here (Fig. 2 to 6), and especially the interactive GIS map, which is uploaded online, will be used in everyday practices of the persons for whom they are indeed intended—persons moving around the city via (powered) wheelchair. Digitisation and data processing of the data collected in the field in GIS informed the assessment of the extent to which public spaces in Zagreb were accessible. The accessibility evaluation, which is presented here, is primarily seen as a basis for overcoming the barriers and obstacles to wheelchair users" mobility in Zagreb.

The research covered only a part of Zagreb. In order to create a comprehensive Zagreb map it would be necessary to continue and extend the research accompanied by further information gathering by applying the aforementioned method. Bearing in mind the fact that the city is continuously changing, we believe that making it possible for the users to enter their feedback on barriers and hindrances to movement in an interactive map would greatly contribute to having more up-to-date information. Reliable and up-to-date information is a necessary prerequisite for designing a navigational system in the next stage of our research.

The next logical step would be for the users to navigate based on these facts. Previous work that focused on considering the best ways to provide directions to persons in wheelchairs towards the most accessible routes yielded several elaborated models. The MAGUS (Modelling access with GIS in urban systems) Model, which uses GIS and a special index calculation (*impedance score*) in modelling the degree of accessibility and thus enables its users to make informed decisions on where to go, can also be used as a guidance tool (Matthews et al., 2002). The U-Access Model informs the users about the shortest routes within a campus, and was developed for three user groups: the independently mobile;

metoda personaliziranoga usmjeravanja korištenjem ARM (*absolute restriction method*) računa optimalne rute za osobe u kolicima s različitim preferencijama (Kasemsuppakorn i Karimi, 2009; Kasemsuppakorn i dr., 2015). Han i dr. (2002) primijenili su robotičku tehniku planiranja kretanja (*robot motion-planning technique*) kako bi na osnovi virtualne simulacije hipotetskoga ponašanja korisnika invalidskih kolica omogućili informaciju o pristupačnosti, tj. omogućili zaključak o tome postoje li u analiziranom prostoru rute kojima se osobe u kolicima mogu koristiti. Neis (2015) je razradio i testirao u Bonnu algoritam za planiranje ruta putem korištenja volonterske geografske informacije (VGI – Volunteered Geographic Information).

Stoga perspektive rada na problematici iznesenoj o ovoj studiji vidimo kako u uključivanju u razradu metodologije navigacije tako i u primjeni te metodologije u izradi mobilne aplikacije koja bi usmjeravala korisnike invalidskih kolica prema optimalnim rutama do željenoga odredišta. Uz obavijesti o prohodnosti pločnika i fizičkim preprekama na njima u aplikaciju bi bilo korisno uključiti i podatke o pristupačnosti javnih objekata i gradskoga prijevoza, čime bi se stvorio cjelovit sustav za podršku kretanju osobama u invalidskim kolicima na prostoru grada Zagreba.

those who need assistance; and the wheelchair users (Sobek and Miller, 2006). The method of customised guidance based on ARM (*absolute restriction method*) calculates the optimal route for persons in wheelchairs with different preferences (Kasemsuppakorn and Karimi, 2009; Kasemsuppakorn et al., 2015). Han et al. (2002) applied the Robot Motion-Planning Technique in order to provide information on accessibility, based on a virtual simulation of wheelchair users' hypothetical behaviour, or more specifically, to facilitate drawing a conclusion on whether there were routes which persons in wheelchairs could use in the analysed area. Neis (2015) elaborated and tested an algorithm for route planning in Bonn, Germany by using VGI: Volunteered Geographic Information.

To sum up, we believe that the prospects for using the work on the issues presented in this study lie both in further elaboration of navigation methodology, as well as in designing a mobile application which would steer wheelchair users towards the most optimal routes to their desired destination. In addition to the information about how passable the pavements are and the physical barriers on them, it would be highly beneficial if the application could also include information on the accessibility of public facilities and public transportation, thus providing an integral system of support to persons in wheelchairs moving around the city of Zagreb.

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