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TRANSPORT DISADVANTAGED SPACES OF THE CITY OF ZAGREB

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Abstract: In this research, transport disadvantaged space is determined by interrelation between the space itself and public transport. Study was divided into two segments using GIS tools and mathematical operations. The first part of the analysis determined buffer space around each public transport station of the City of Zagreb regarding to residential purpose land-use. For the daily public transport buffer space was 400 m, while for the night it was 800 meters. Both of these public transport aspects pointed to certain spaces of the City of Zagreb which were not covered by public transport. The second aspect of this research included parameter of public transport frequencies. For the daily public transport, average frequency per hour was calculated for each bus- and train- station in the City of Zagreb, with exception of tramway stations, due to high frequency of tramway lines. Thereby, the public transport stations with below- and above-average frequencies were differentiated. These values were paired with buffer of 400 m, thereby obtaining city spaces which gravitate to below- or above-average frequent public transport stations. This research pointed out city districts that are highly transport disadvantaged. Especially outstanding parts are south, southwest, east and northeast part of the City of Zagreb.

Keywords: transport disadvantage, space, public transport, buffer, City of Zagreb.

1. Introduction

Transport disadvantage is widespread phenomenon that can affect both, spaces and people. This paper investigates transport disadvantage of space. Certain areas (e.g. urban or rural spaces) may be disadvantaged due to transport. Low public transport frequency or its complete absence, inadequate roads, lack of sidewalks or lightning are just some of the reasons that put one space in a worse position compared to the other (Murray and Davis, 2001).

The problem of transport disadvantaged spaces can be studied from different aspects. Taken that public transport is a service that should be available to everyone, the simplest approach of exploring transport disadvantaged spaces is the relation between space and the public transport system. Some authors (Murray and Davis, 2001; Hurni, 2007) defined transport disadvantaged spaces as areas where public transport service is not available or is very limited. Public transport is used by different social groups for various reasons, therefore, this research was conducted based on the interrelationship between space and the public transport system.

In the Croatian scientific bibliography, only a few papers (e.g. Gašparović, 2014; Gašparović, 2017) studed the problem of

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transport disadvantage from the aspect of transport disadvantaged people, analyzing the problems young people have in everyday life due to transport and due to living location in the city center and city periphery. The complete lack of research of transport disadvantaged spaces in the Croatian scientific bibliography was the motive for writing this paper. The aim of this paper was to investigate the transport disadvantaged spaces in the City of Zagreb. The first part of the research determined transport disadvantaged space based on buffers around the public transport station. The second part of the research included the public transport frequency and thus public transport stations with below and above the average frequency were distinguished. Next, the obtained values were paired with the values of buffers around the public transport station.

2. Theoretical Framework and Literature Review

Today, mobility and accessibility to different activities and services are important segments in people's lives. The people's mobility and accessibility to activities and services also affect the characteristics of the area where they live (the extent of available transport services in that area and the extent of activities' locations that people want to access) (Hurni, 2006). These factors can lead to transport disadvantage. Kroen (2011) stated that people's mobility can be affected by the lack of public transport in certain area or by its rare frequency, the inability of a person to afford transport services, the living location in relation to the transport services and the desired activities, and so.

Transport disadvantage main components are mobility and accessibility (Kamruzzaman and Hine, 2011). Accessibility is parameter which is crucial part of the function of determining transport disadvantaged space. It is also the most important spatial factor which affects development and use of public transport (Bole, 2004; Kozina, 2010). In this context, accessibility is defined as coverage of the space with public transport stations. Studies shown that the distance from the public transport station reduces the probability of using public transport as a way people meet their transport needs (Bole, 2004). In this case, adults primarily focus on car transport, while some other social groups (e.g. young people) have to rely on adults (e.g. parents, relatives or friends) for transportation. The later can also continue to use public transport causing increased travel time, as well as difficulties in accessing certain life activities or opportunities or even making them impossible. Similar problems will be encountered by handicapped people and older people who do not drive the car.

According to (Wixey *et al.,* 2005; Currie and Delbosc, 2011b) transport disadvantaged space can be defined as the area where the degree of accessibility is not high enough to allow unimpeded access to life activities. The ability of a transport system to connect people with life opportunities and possibilities depends on different factors. These factors are sorted differently by various authors according to their own criteria. Thus, Hurni (2006) describes two groups of factors that distinguish transport disadvantaged space. The first group includes transport based factors (transport accessibility factors), such as transport mode (public transport, car, hiking, cycling, etc.), availability of transport service in terms of the public transport station distance in relation to the residence place and the

location of the activity, the public transport frequency, the public transport operation time, the suitability of transport mode for the travel purpose, the cost of transport and information about transport services. The second group of factors refers to the characteristics of space (factors of urban accessibility): the location of activities and services, the level of infrastructure development (e.g. number of pedestrian and cycling paths and their maintenance, road crossings etc.), topography, working time of activities and services.

Other authors point out some other factors which spatial transport disadvantage depend on. For example, Murray and Davis (2001) state that spatial transport disadvantage depends on the residence place, spatial distribution of the activities that people want to access and the inadequate level of transport services in certain space.

In contrast to the Croatian scientific bibliography, international scientific bibliography provides many papers about the transport disadvantage of space, some of which are listed in this paper. Research of the United Kingdom's Department for Transport has shown that periurban and rural areas in the United Kingdom are often characterized by the lack of night-time public transport (House of Commons, 2013). Lack or very low frequency of public transport is also present in the periurban and rural areas of Australia (Currie *et al.,* 2005). Melbourne's periurban area are characterized by low frequencies of buses and trains, as well as difficulties in finding taxi (Duff and More, 2015). In addition, other authors found that the degree of transport disadvantage was increasing with the increasing distance from the center of Melbourne (Currie *et al.,* 2009; Delbosc and Currie, 2011a; Delbosc and Currie 2011b). Hurni (2007) points out the problem of low frequency of public transport in the west part of Sydney. Mattioli and Colleoni (2016) illustrated the spatial dimension of all forms of car-related transport disadvantage in Germany and the United Kingdom, pointing to the different problems experienced by people living closer the city center compared to the people living in the city's periphery. Hine and Mitchell (2001, 2003) detected transport disadvantaged spaces in Scotland. Rural areas are often transport disadvantaged. Hine (2011) emphasizes the problem of provision of fewer higher frequency or limited service routes in rural areas. Kamruzzaman and Hine (2011, 2012) deal with the transport disadvantaged of rural space taking the Northern Ireland as an example.

3. Methodology

In this paper the space of the City of Zagreb in its administrative boundaries was investigated. The study was performed at the level of city districts. The City of Zagreb consists of 17 city districts (Fig. 1.). Public transport in the City of Zagreb is organized in the form of tram, bus and train transport (Fig. 2.). Tram network is covered by 116 kilometres of railways within 15 daily and 4 night tram lines. Bus network in the City of Zagreb is operated by 131 daily and 4 night lines, covering 585 km. Tram and bus services are managed by the city-owned company Zagreb Electric Tram (in Croatian Zagrebački električni tramvaj). The urban railway in the City of Zagreb covers a total of 58 kilometres of railway lines by 4 lines. The urban railway is managed by the state-owned company Croatian Railways (in Croatian Hrvatske željeznice).

Fig. 1.
City Districts of the City of Zagreb
Source: based on the Data of National Geodetic Directorate

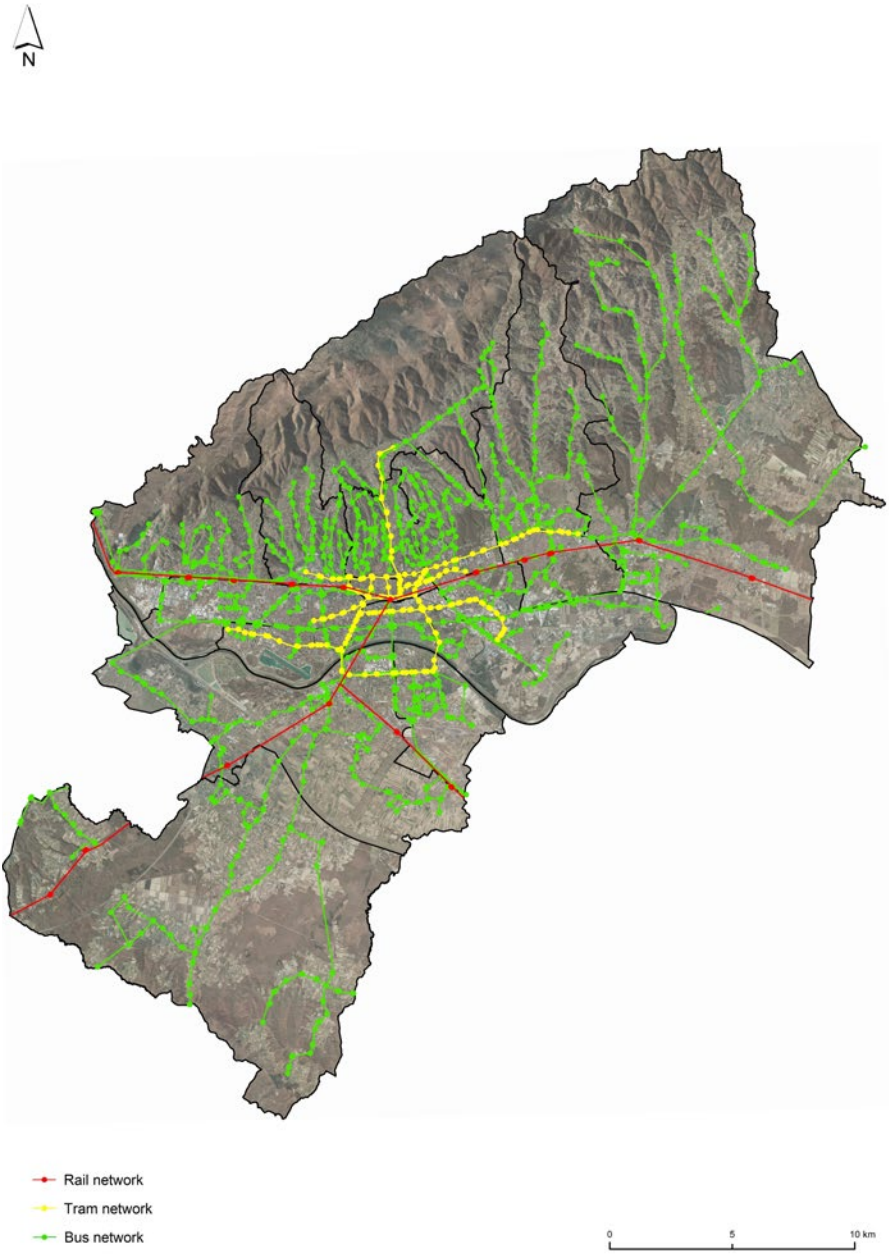

Fig. 2.
Public Transport System of the City of Zagreb
Source: based on Field Research and Cartographic Determination; DOF layer, 2012

Public transport station coordinates were used for the analysis. Part of the public transport

stations coordinates were obtained by field research using the recreational GPS device Garmin Oregon 450 with the horizontal accuracy of the device ± 5-15 meters. Field research of public transport stations coordinates consisted of visits to individual public transport station and reading and recording of coordinates. Part of the public transport stations coordinates were obtained using Google Earth. This process included determination of public transport stations on Google Earth, reading out and recording coordinates. There were 1847 coordinates of bus, tram and railway traffic stations in the City of Zagreb.

The parameter of accessibility of the public transport station was used to determine transport disadvantaged spaces. This process included determination of the distance from a station that people find acceptable. Literature data point to the distance of up to 400 meters which is usually considered as an appropriate for individual to use public transport stations, particularly in bus traffic (O'Neill *et al.,* 1992; Murray and Wu, 2003; Hurni 2006; Hurni 2007; Kimpel *et al.,* 2007; Gutiérrez and García-Palomares, 2008; Foda and Osman, 2010; Bukhari *et al.,* 2010). Here, it should be explained that the above-mentioned studies consider that an acceptable walking distance is 5-minute walk to the public transport station which corresponds to a distance of 400 meters (according to TfL, 2010, the average walking speed is 4.8 km/h). For these reasons, this distance of 400 m was also used in this paper as a parameter of accessibility to determine transport disadvantaged spaces in the segment of daily public transport. The distance of 400 meters is taken for all forms of public transport in the City of Zagreb, although for railway transport sometimes 800-meter distance can be used (e.g. Murray *et al.,* 1998; Hurni, 2006; Hurni, 2007). For the night public transport distance to 800 meters between place of residence and the public transport station was used to determine the transport disadvantage areas. Taken the considerably smaller number of lines and operating during the night and lower frequency, it was assumed that individuals were ready to walk tice as long compared to the day. Buffers were established around each public transport station in the City of Zagreb in the amount of 400 meters for all daily public transport and 800 meters for all night public transport using GIS. Additional 10 meters have added to all buffers due to possible inaccuracies of the GPS device, the DOF 2012 and Google Earth. The analysis of the transport disadvantaged spaces was carried out with respect to residential purpose land-use areas (based on the digital database of the Zagreb City Strategic Planning Office, 2013). Spaces outside the buffers of 400 meters / 800 meters are defined as transport disadvantaged spaces of the City of Zagreb.

In order to additionally differentiate transport disadvantaged spaces of the City of Zagreb, the analysis also included the daily public transport frequency. Namely, although some space was covered by a 400-meter buffer, it is quite different if a public transport operated at a station of interest very often or very rarely. Therefore, a certain level of transport disadvantage can be manifested not only in the absence of public transport but also in its frequency. Since public transport is running on a predetermined timetable, it was necessary to define the time frame for operating of public transport, i.e. on its stations. Therefore, the average number of departures per hour was calculated for each station to differentiate the stations according to the average of

number of departures (especially those above and below average). Calculations were made according to official timetables of the Zagreb Electric Tramway and Croatian Railways. Since the frequency of departures of tramways is considerably higher in relation to the bus and train, the average number of departures in one hour has not been calculated for the trams. Instead, it was assumed that all tram stations have above average number of departures.

Thus, the calculation refers to the average number of departures per day during daily transport. The average number of departures for each station was calculated by dividing sum of the value of all departures of the bus or train on that station with 7 (number of days per week) and then by the number of operating hours. The value of 22 was taken for bus transport (as daily transport operates from 04:00 to 01:59), while for the train it was 21 (as the daily transport runs from 04:00 to 00:59). According to the schedule of ZET and CR it was established that certain departures after midnight are still counted as daily transport system despite the fact that it is extremely late in the evening. The obtained values were paired with the buffers values of 400 meters around the public transport station.

Here, we did not differentiate particular types of public transport, although railway transport has different characteristics then bus and tram transport, especially in the context of urban transport (way of operating, timetable, stations, etc.). The ratio behind this decision was found in the fact that railway transport in the City of Zagreb is being used as public transport. Also, differences were not made within the urban and suburban bus transport, and all ZET bus lines were considered within the urban transport.

4. Results and Discussion

The existence of residential purpose land-use spaces of the City not covered by public transport are showed in both, the day and night public transport.

The residential purpose land-use areas of the City of Zagreb covers 90.4 km^2, leaving 12.9 km^2, or 14.2 % of the total area, outside the optimum buffers of 400 meters in the segment of daily public transport. Most of the areas not covered are seen in the southern, southwestern, eastern and northeastern parts of the City of Zagreb, as well as in the far sub-mountainous area of the City of Zagreb (Fig. 3.). This is periurban areas of the city, and the population density in these areas is considerably lower and dispersed compared to the central, western and northwest part of the City of Zagreb. For this reason, these spaces are more difficult to cover by public transport in order to remain less traffic-free parts of the city, as in the case, for example, of the western part of the City of Zagreb.

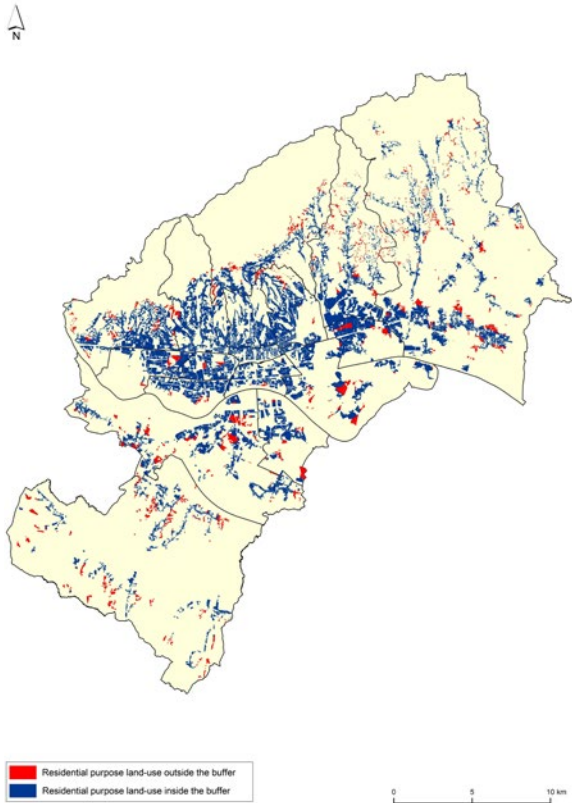

Fig. 3.
Transport Disadvantaged Spaces in The Segment of Daily Public Transport
Source: based on Analysis of Existing Land Use and Urban Densities 2011; Field Research and Cartographic Determination; ZET Timetables

In addition, the transport network in these areas is not as dense as in the central part of the City of Zagreb. Also, it is not as dense as the western and northwestern parts of the City of Zagreb. Furthermore, in those areas there is no tram network which would provide complete buffer space coverage due to the small distance between the stations. Considering the physical-geographical and socio-geographical factors, it is easily seen that in these, markedly disadvantaged parts of the City of Zagreb bus lines operate mostly on major roads, leaving distant spaces not covered by public transport. The central part of the City of Zagreb, with very rare exceptions, is located completely inside the buffers, pointing to the fact that transport availability in this part of the city is at an exceptionally high level. Of course, such a situation is expected with regard to trams, railways, and some bus lines that operate very close to the city center (e.g. bus terminal at Kaptol, Main Train Station, Britanski Square and as such). The area of Novi Zagreb is also highly covered by buffers, while areas of

Bundek and the southern part of Savski Gaj and Trnsko are not covered. The western part of the city shows satisfactory level of public transport availability. Due to the tram line to Prečko and many bus lines from the terminals Črnomerec and Ljubljanica, this part of the city is mostly located within the buffers. Although disadvantaged spaces in the mountainous areas of the western part of the city can be noticed, such parts are relatively small. The reason for this is small distance between the roads (in the direction of the south - north) where buses operate, so the buffers usually touch or even overlap. In this context, the situation is different when one considers the eastern, northeastern, southern and southwestern parts of the city, since in those parts the main roads are further apart thereby leaving spaces beyond acceptable accessibility. This is particularly noticeable in the area of the northeastern part of the city.

In order to further confirm the previously stated facts the analysis of residential purpose land-use areas remaining outside the optimum buffers within the city districts was obtained (Table 1; Fig. 4.). By analyzing the mentioned data and the figure in respect to the urban areas it can be seen that the share of residential purpose land-use spaces outside the buffers in relation to the total area with residential purpose land-use increased by moving away from the city center. Thus, the city district of Donji grad has no space outside the optimum buffers, while the Brezovica district is most prominent, with more than 1/3 (35.64 %) of the residential purpose land-use space outside the optimum buffer, and the Novi Zagreb – zapad district where more than 1/5 (21.42 %) of residential purpose land-use space is outside the buffers. There are also city districts of Sesvete (18.78%) and Podsljeme (18.02 %) with 1/5 of the residential purpose land-use space outside the optimal buffers.

Table 1

Residential Purpose Land-Use Spaces outside the Buffer in the Segment of Daily Public Transport

City district	Area (in km^2)	Area outside the buffer (in km^2)	Share outside the buffer (in %)
Donji grad	1.32	0.00	0.00
Gornji grad - Medveščak	3.72	0.02	0.45
Trnje	2.51	0.06	2.46
Črnomerec	5.82	0.23	3.94
Trešnjevka - sjever	3.11	0.15	4.78
Trešnjevka - jug	2.91	0.16	5.33
Maksimir	5.07	0.30	5.83
Stenjevec	3.02	0.27	9.00
Podsused - Vrapče	7.03	0.79	11.28
Donja dubrava	3.72	0.47	12.70
Gornja Dubrava	7.75	1.06	13.73
Peščenica - Žitnjak	5.83	0.87	15.01
Novi Zagreb - istok	3.08	0.49	15.81
Podsljeme	4.50	0.81	18.02
Sesvete	15.16	2.85	18.78
Novi Zagreb - zapad	9.20	1.97	21.42
Brezovica	6.65	2.37	35.64

Source: based on Analysis of Existing Land Use and Urban Densities, 2011

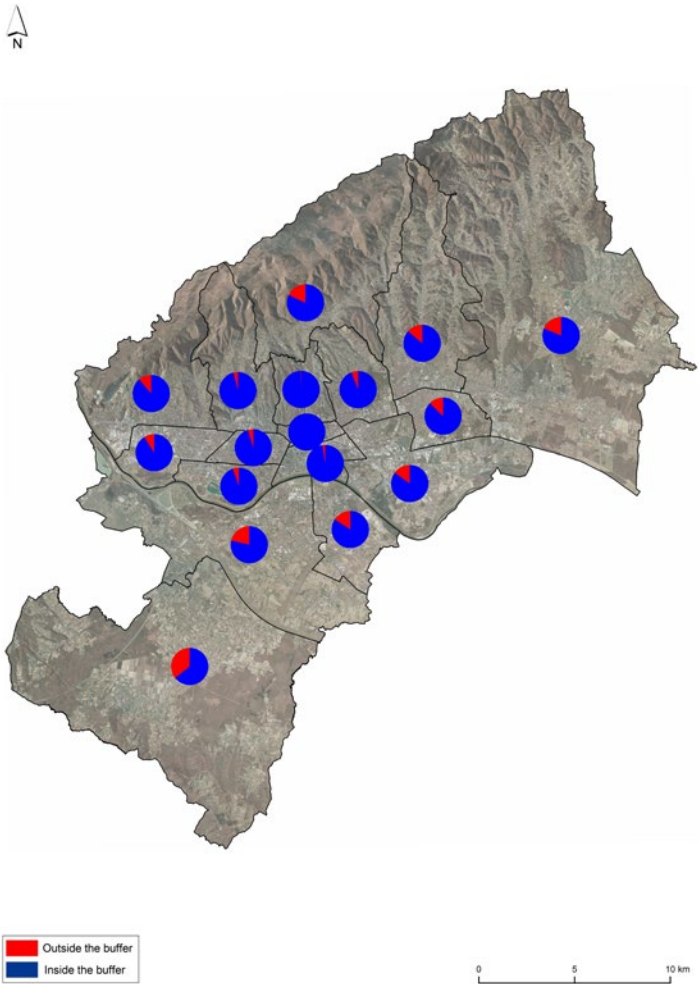

Fig. 4.
Residential Purpose Land-Use Spaces Inside and Outside the Buffer in The Segment of Daily Public Transport
Source: based on Analysis of Existing Land Use and Urban Densities 2011; Field Research and Cartographic Determination; ZET Timetables; DOF Layer, 2012

In the segment of night public transport, there are even more transport disadvantaged spaces compared to the segment of daily public transport (Fig. 5.). However, such a situation is expected, as the night public transport operates on the basis of only four night tram transport and four lines of night bus transport. Consequently, most of the residential purpose land-use areas of the City of Zagreb is not covered in regards with public transport. Out of a total of 90.4 km^2, transport disadvantaged is 63.9 km^2, being more than 2/3 of the residential purpose land-use spaces, i.e. 70.7 %. Particularly

critical areas are southern and southwestern and the northeastern and eastern parts of the City of Zagreb. The northern part of the City of Zagreb mostly is not covered by public transport. The northern segment of the western part of the city is also not covered, which has relatively densely populated residential purpose land-use area. As already mentioned, spaces in a favorable situation are those covered by night public transport, organized on the basis of trams and four lines of buses. This certainly is the space of the wider city center and part of Novi Zagreb, with the addition of some "axles" with public transport, such as Ilica / Aleja Bologne, Dubrava (over Dubec to Sesvete), Jarun / Prečko, Mihaljevac / Dolje, Velikogorička cesta.

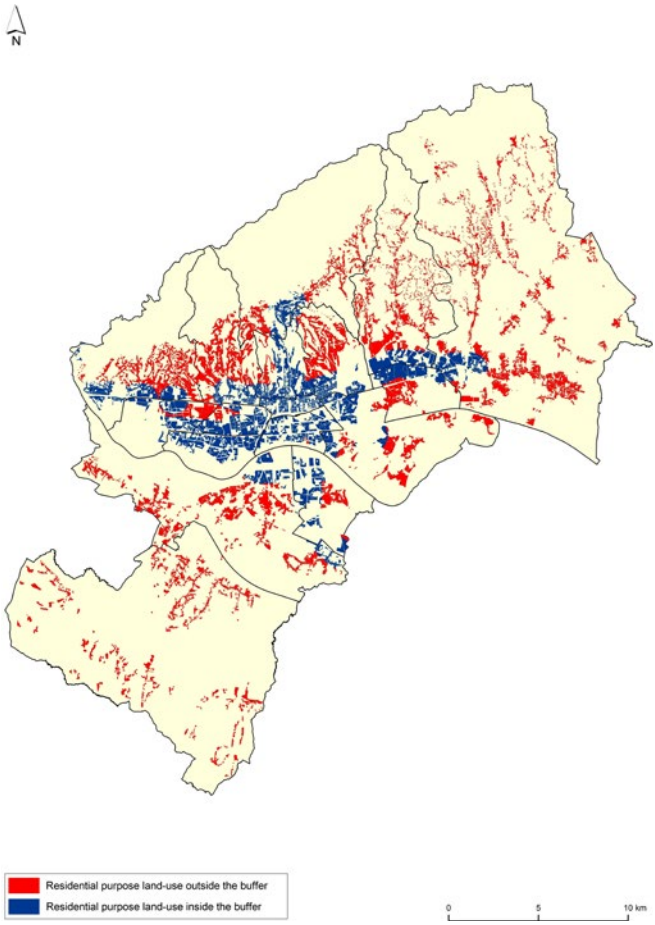

Fig. 5.
Transport Disadvantaged Spaces in The Segment of Night Public Transport
Source: based on Analysis of Existing Land Use and Urban Densities 2011; Field Research and Cartographic Determination; ZET Timetables

Similar analysis can be performed also for the night public transport (Table 2; Fig. 6.). The city district Donji grad is in the best position as it does not have a residential purpose land-use area outside the optimal buffers. The share of residential purpose land-use areas outside the buffers is rising by moving away from the center, but the city districts where public night transport operates are in better position. Although being further away from the city center, Novi Zagreb - istok and Stenjevec are examples of such city districts. The worst position has Brezovica district with 100 % of the residential purpose land-use area outside the buffers, followed by the city districts Sesvete and Novi Zagreb - zapad with over 80 % of the residential purpose land-use area outside the buffers. Certain urban districts are in a favorable position within the daily public transport, while in the context of night public transport are significantly transport disadvantaged. Such an example is the city district Črnomerec, where the share of residential purpose land-use area within the daily public transport outside the buffers is only 3.94 %, putting it among the top of the city districts. On the other hand, looking at buffers in the night public transport, Črnomerec district has over 3/4 (78.06 %) residential purpose land-use areas outside the buffers, thereby being one of the top transport disadvantaged city districts of the City of Zagreb.

Table 2

Residential Purpose Land-Use Spaces outside the Buffer in the Segment of Night Public Transport

City district	Area (in km^2)	Area outside the buffer (in km^2)	Share outside the buffer (in %)
Donji grad	1.32	0.00	0.00
Trešnjevka - jug	2.91	0.01	0.11
Trnje	2.51	0.03	1.38
Trešnjevka - sjever	3.11	0.39	12.60
Gornji grad - Medveščak	3.72	0.72	19.31
Novi Zagreb - istok	3.08	1.01	32.84
Stenjevec	3.02	1.09	36.15
Donja Dubrava	3.72	1.56	41.86
Peščenica - Žitnjak	5.83	3.47	59.60
Podsused - Vrapče	7.03	4.53	64.48
Maksimir	5.07	3.54	69.71
Podsljeme	4.50	3.24	72.01
Gornja Dubrava	7.75	5.85	75.43
Črnomerec	5.82	4.54	78.06
Novi Zagreb - zapad	9.20	7.39	80.39
Sesvete	15.16	13.24	87.29
Brezovica	6.65	6.65	100.00

Source: based on Analysis of Existing Land Use and Urban Densities 2011

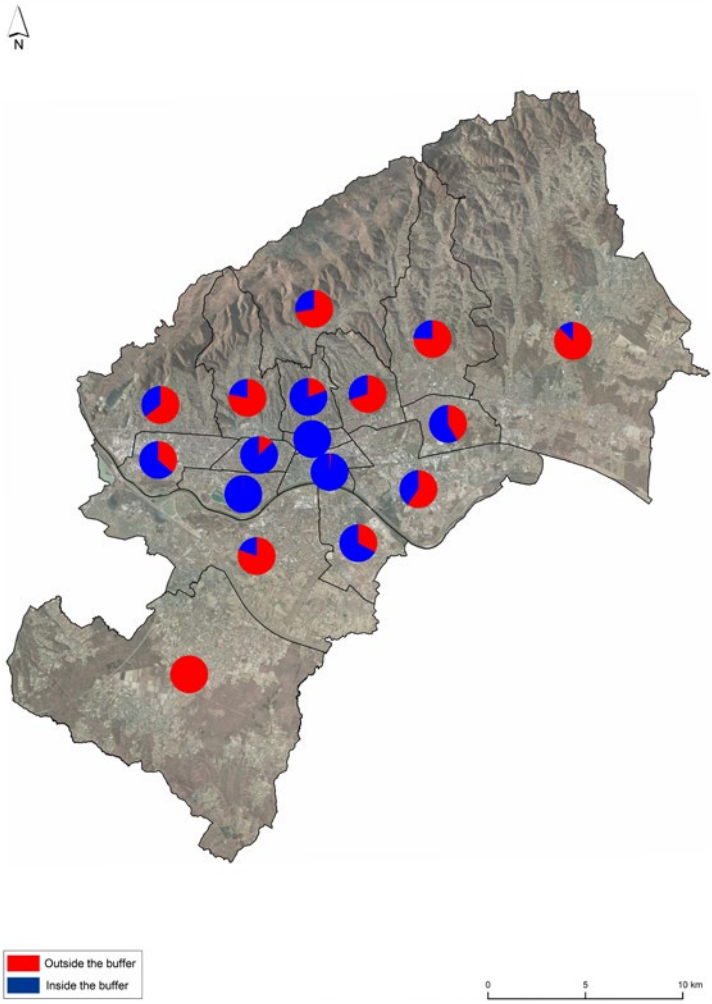

Fig. 6.
Residential Purpose Land-Use Spaces inside and outside the Buffer in the Segment of Night Public Transport
Source: based on Analysis of Existing Land Use and Urban Densities 2011; Field Research and Cartographic Determination; ZET Timetables; DOF Layer, 2012

In order to further differentiate the transport disadvantaged residential purpose land-use areas of the City of Zagreb, the analysis also included the parameter of the public transport frequency (Fig. 7.). The residential purpose land-use areas of the City of Zagreb covered by a buffers with stations having below the average public transport frequencies are almost entirely related to the southern and southwestern parts of the City of Zagreb, its eastern and northeastern part, and most of the submountainous zone. In the vicinity of the city center, there is a mix of stations with the above and below the average frequencies,

and the situation is considerably improved by the tram transport. Also, stations with above the average frequencies are located on larger and busier streets in Zagreb (e.g. Ilica - Aleja Bologne, Zagrebačka – Ljubljanska avenija, streets to Velika Gorica, Sesvete, Lučko and so). Bus stations in certain parts of the city, e.g. in Novi Zagreb, in direction to Trnava, Kašina, etc. also have above the average frequencies. Considering the rail transport, all stations on railway lines to Karlovac and Sisak have lower frequency. Busiest railway line is west-east axle as part of the Zaprešić - Dugo Selo city rail.

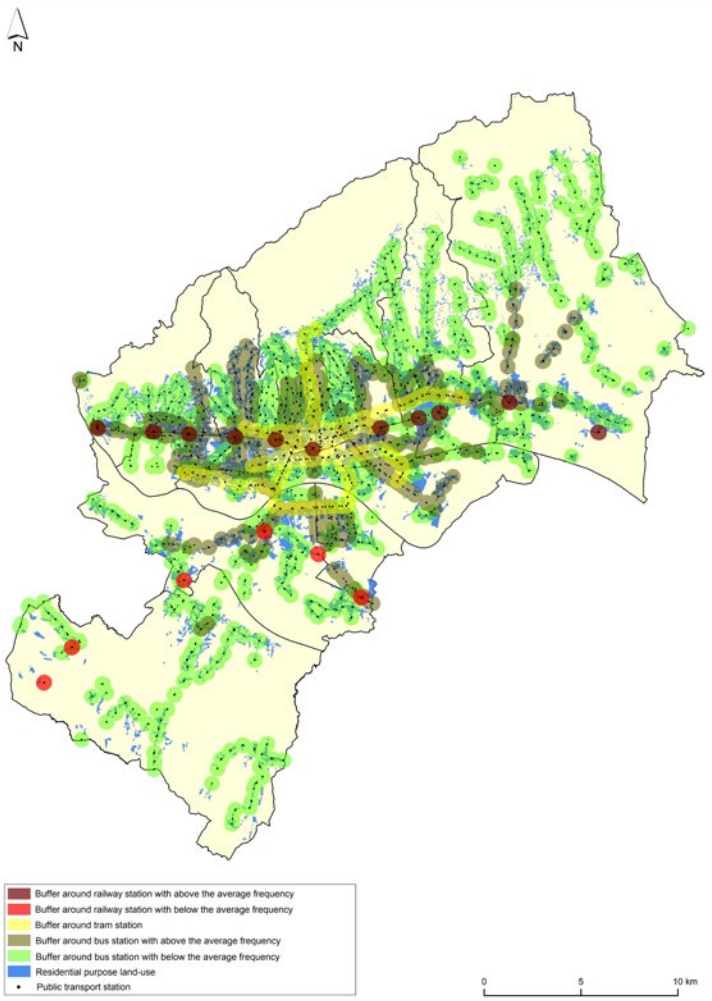

Fig. 7.
Transport Disadvantaged Spaces in The Segment of Daily Public Transport (Buffers + Frequencies) Source: based on Analysis Of Existing Land Use and Urban Densities 2011; Field Research and Cartographic Determination; ZET Timetables

More detailed analysis was carried out at the level of districts of the City of Zagreb (Table 3; Fig. 8.). Here, it should be emphasized that the residential purpose land-use areas where above and below average frequencies overlap were classified as areas gravitating to above frequency buffers, assuming the superposition of the above-average buffers to the below-average buffers. Here, it can be also seen that the share of residential purpose land-use areas that belong to below average frequency buffers increased by moving away from the city center. Thus, in the city district Donji grad, all residential purpose land-use areas belong to buffers with above average frequency of daily public transport. In contrast to Donji grad, city districts Gornja Dubrava, Novi Zagreb - zapad, Sesvete, Podsljeme and Brezovica are in the worst position, where daily public transport has frequency below the average. In these city quarters almost 50% of the residential purpose land-use area (Gornja Dubrava 49.68 % and Novi Zagreb - zapad 48.26 %) belongs to the buffer with below average frequency of daily public transport. The situation in the city districts Sesvete (56.60 %), Podsljeme (62.89 %) and Brezovica is even worse (61.65 %) considering that in those districts over 50 % of the residential purpose land-use area belong to the buffer with below the average frequency of daily public transport. It is worth highlighting the particular poor situation in Brezovica district, where only 2.71 % of the residential purpose land-use area belongs to the buffer with above the average frequency of public transport, while 35.64 % of the residential purpose land-use area does not belong to an optimal buffer of 400 meters.

Table 3

Coverage of Residential Purpose Land-Use Spaces with above and below the Average Frequencies of Public Transport

City district	Residential purpose land-use (km^2)	Inside the buffer with above the average frequency		Inside the buffer with below the average frequency		Outside the buffer	
		Area (km^2)	Share (%)	Area (km^2)	Share (%)	Area (km^2)	Share (%)
Donji grad	1.32	1.32	100.00	0.00	0.00	0.00	0.00
Trnje	2.51	2.75	88.42	0.21	6.75	0.15	4.83
Trešnjevka - jug	2.91	2.53	86.94	0.22	7.56	0.16	5.50
Stenjevec	3.02	3.06	82.26	0.64	17.20	0.02	0.54
Novi Zagreb - istok	3.08	1.79	71.31	0.65	25.90	0.06	2.39
Trešnjevka - sjever	3.11	2.14	70.86	0.61	20.20	0.27	8.94
Gornji grad - Medveščak	3.72	2.08	67.53	0.51	16.56	0.49	15.91
Donja dubrava	3.72	2.47	66.40	0.78	20.97	0.47	12.63
Podsljeme	4.50	3.59	61.68	2.00	34.36	0.23	3.96
Maksimir	5.07	3.37	57.80	1.59	27.27	0.87	14.92
Črnomerec	5.82	3.67	52.20	2.57	36.56	0.79	11.24
Peščenica - Žitnjak	5.83	2.55	50.30	2.22	43.79	0.30	5.91
Brezovica	6.65	2.84	36.65	3.85	49.68	1.06	13.67
Podsused - Vrapče	7.03	2.79	30.33	4.44	48.26	1.97	21.41
Gornja Dubrava	7.75	3.73	24.60	8.58	56.60	2.85	18.80
Novi zagreb - Zapad	9.20	0.86	19.11	2.83	62.89	0.81	18.00
Sesvete	15.15	0.18	2.71	4.10	61.65	2.37	35.64

Source: based on Analysis of Existing Land Use and Urban Densities, 2011

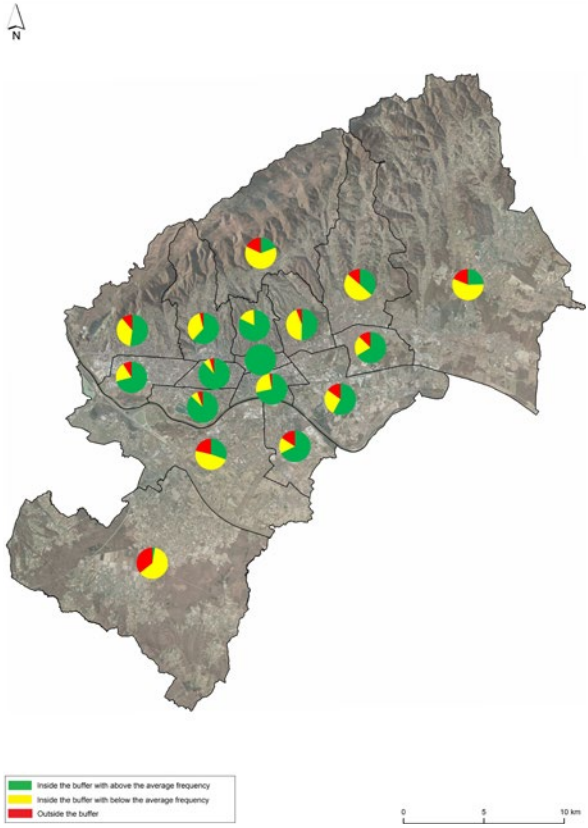

Fig. 8.
Residential Purpose Land-Use Spaces inside and outside the Buffer with above the average and below the average Frequencies of Public Transport
Source: based on Analysis of Existing Land Use and Urban Densities 2011; Field Research and Cartographic Determination; ZET Timetables; DOF Layer, 2012

3. Conclusion

It can be concluded that certain parts of the city are affected by high degree of transport disadvantage. Thereby, the south and southwestern and eastern and northeastern parts of the City of Zagreb can be highlighted. These are the areas where the spatial distribution of public transport lines is rare, hence larger areas remain outside the acceptable distance from the stations. In addition, areas belonging to buffer of 400 meters are largely characterized by the gravitational influence of public transport stations where frequencies are below the average for the City of Zagreb. Living in these areas, and generally, in areas not covered by the buffers or with below the average frequencies of public transport has consequences on the everyday lives of people. They have more problems in performing life activities, thus their quality of life is lowered.

The process of reducing transport disadvantage should be conducted with multidisciplinary approach of various professions and institutions. The issue of transport disadvantage should be incorporated in the spatial planning system and into the legal framework of state social policy. Emphasis should be put on various research within determining transport disadvantaged spaces. Raising the awareness of people about these kinds of inequity in society and achieving transport and social justice should become ultimate goals of planning process.

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