ARTICLES

SPATIAL DIFFERENTIATION OF THE IMPACT OF TRANSPORTATION ON PEOPLE'S EVERYDAY LIFE

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ABSTRACT
Spatial differentiation of the impact of transportation on people's everyday life
The everyday activities of people urge the necessity of mobility in space, where spaces differ in their transportation characteristics, which leads to a different impact of transporation on the everyday life of the people who live in them. The Municipality of Sveti Ivan Žabno was chosen for the study as a case study of spatial differences in transporation characteristics. In this municipality there is a pronounced spatial polarization in terms of transportation characteristics. Thus, depending on the distance from the main transportation routes, it is possible to distinguish the areas with more favorable and less favorable transportation characteristics. The aim of this paper is to define the spatial differentiation of the impact of transportation on the everyday life of people living along and away from the main roads in the Municipality. The methodology of the study is based on the qualitative method of the interview and the use of GIS. Research has shown that young people and older people had more difficulties with transportation than adults. This was particularly pronounced in the part of the Municipality further away from the main transportation routes, where the possibility of using public transportation was difficult and the problem of the difficulty of people's participation in everyday activities was pronounced. Along the main roads the question of safety of pedestrians and cyclists arose due to the lack of sidewalks and cycle paths.

KEY WORDS
impact of transportation, spatial differentiation, everyday life, Sveti Ivan Žabno, transportation geography.

1. Introduction

Research trends in transportation geography are increasingly focused on studying the impact of transportation on people. Due to their everyday obligations and activities, people are mobile in space and thus become part of the transportation. According to Vresk (1997), transportation is one of the basic life functions and more recently a necessity to adapt to noticeably faster flows and processes. Mobility and accessibility will play a very important role in enabling access to everyday activities (Gašparović, 2016).

However, a distinction can be made between certain social groups in society which, for certain reasons, will have greater restrictions on mobility and accessibility and thus on access to the activities they want. They will have great difficulties in traveling when and where they want to (Denmark, 1998; Gašparović and Jakovčić, 2014), i.e. they will be transportation disadvantaged. These are mostly vulnerable social groups (e.g. young people, old people, disabled, single parents) (Gašparović, 2016). Factors that lead to such problems are often of a personal nature (e.g. age, physical characteristics of the persons, unemployment, inability to use a car and financial status) (Hurni, 2006). However, not only factors of a personal nature will lead to problems in accessing the desired activities. They are also influenced by the characteristics of the space in which people live. In the transportation context, this is the extent of available transportation services in certain area (Gašparović, 2017). Accordingly, problems of access to desired activities may also arise due to the low frequency of public transportation or its complete absence in certain area, high prices for transportation services, the living location in relation to transportation services and desired activities, and inadequate transportation infrastructure (Murray and Davis, 2001; Kroen, 2011). Such areas can be considered as transportation disadvantaged areas. Whether or not they are vulnerable social groups, it can be assumed that people living in such areas will have problems accessing the desired activities. Certainly, transportation disadvantaged social groups will have the most problems in everyday life, and they will be particularly pronounced if they live in a more transportation disadvantaged area.

The spaces will differ in their transportation characteristics, resulting in different impacts of transportation on the daily lives of the people who live in them. In addition, settlements along important transportation nodes or closer to more important transportation routes will have a better development perspective and combine a greater number of functions (Ilić, 1995). This will have an impact on the different quality of life of people and ultimately on transportation and social justice. The researched area in this paper was chosen because of its favorable transportation-geographical position at the border of the road routes between Zagreb, Bjelovar and Križevci and the railway line Bjelovar - Križevci.

However, transportation characteristics in the Municipality are not the same in the whole observed area, so the aim of this paper is to determine whether there is a spatial differentiation of transportation impact on the everyday life of people living along the main transportation routes or remotely in the Municipality of Sveti Ivan Žabno, and how it manifests itself in the lives of people.

In accordance with the aim of the research in the observed area, this paper attempted to test several hypotheses: H1: The population of the northern part of the Sveti Ivan Žabno Municipality has greater difficulties in participating in daily activities due to the location of transportation routes in the Municipality. H2: Old people have the most transportation problems in everyday life in the Municipality.

The issue of the impact of transportation on people's lives is relatively new in Croatian scientific bibliography, and there are not many contributions to this topic. Gašparović (2014) in his paper considered transportation disadvantage from a theoretical point of view. Gašparović and Jakovčić (2014) dealt with different degrees of transportation disadvantage of secondary school students in the City of Zagreb, and Pleić and Jakovčić (2017) dealt with the impact of transportation connectivity on the school success of secondary school students in Donji Miholjac. The impact of transportation on people's lives was also investigated by Miletić et al. (2017). They analyzed the factors that contribute to the use of public and car transportation from the perspective of the transportation mode choice as one of the aspects of people's travel behavior. Šipuš et al. (2019) examined the criteria that influence the implementation of a fair tariff system in integrated public transportation, as well as their interrelation and impact on the implementation itself.

There are few studies on the Municipality of Sveti Ivan Žabno. Only few articles, mostly by local authors, especially by Šramek (2011, 2015), about the development and customs of the Municipality could be found. So far no article has been written about the impact of transportation in the Municipality of Sveti Ivan Žabno, so the main motive of this paper is to contribute to the impact of transportation on people's lives and to lay the basis for a more comprehensive and detailed analysis of transportation problems in this area.

2. Research methodology

In line with new approaches in transportation geography, the paper is based on a qualitative method of semi-structured interview to obtain direct information, opinions, attitudes and experiences of transportation and possible problems that residents face in their daily lives. The interview was conducted with a total of 12

respondents on four days in March 2019, so that transportation conditions do not change and thus may influence the respondents' responses. The sample was made by randomly selecting the respondents. The respondents were equally distributed by gender and age to obtain the most relevant data possible. Respondents were also equally distributed by place of residence throughout the Municipality. Six females and the same number of males were interviewed, four from each age group. The age groups in this study were young people (0 – 19 years old), adults (20 – 59 years old) and old people (60 years and older). All interviews were recorded by a recorder and later transcribed. In-depth interviews provided a detailed overview of the spatial problems and based on the results of the interviews the necessary improvements in transportation in the observed Municipality were concluded.

The method of analyzing spatial relations using GIS tools was also performed. Using the ArcGIS 10.4 program, maps were created, and the buffer method was used to determine a distance of 1 km from the public transportation stations in the Municipality, thus determining their accessibility. Although buffers are usually defined at a distance of 400 meters for bus stations (Gutiérrez and García-Palomares, 2008; Foda and Osman, 2010; Bukhari et al., 2010) and at a distance of 800 meters for train stations (Murray et al., 1998; Hurni, 2006; Hurni, 2007), these data refer to the urban area. Since a rural area is studied where the distances between public transportation stations are much greater than in the city, the buffers are somewhat larger. Relevant demographic and transportation-geographical data were prepared by statistical analysis and description.

In Croatia, roads are categorised as follows (labelled with a letter and a number): motorway = autocesta (Ax); state road = državna cesta (Dx); county road = županijska cesta (Žx); local road = lokalna cesta (Lx). For the purpose of this paper, the Croatian abbreviated labels will be used, e.g. state road D22. Since the Census was held in 2011, the method of linear extrapolation was used to project the population. This method is often used in demographic research (see e.g. Živić, Turk, 2014).

3. Spatial framewrok and characteristics of the research area

The Municipality of Sveti Ivan Žabno is peripherally located in the southwest of the Koprivnica-Križevci County in Central Croatia and covers an area of 106.6 km². It comprises 16 settlements. Numerous transportation-geographical advantages of the Municipality are manifested in its location at the intersection of important transportation routes to the regional centers of Križevci, Bjelovar and the capital Zagreb (Figure 1). It is precisely for this reason that it interacts with these cities in a variety of ways in economic, educational, cultural and

administrative terms (Dokuš, 2004). The main transportation modes in the Municipality are road and railway.

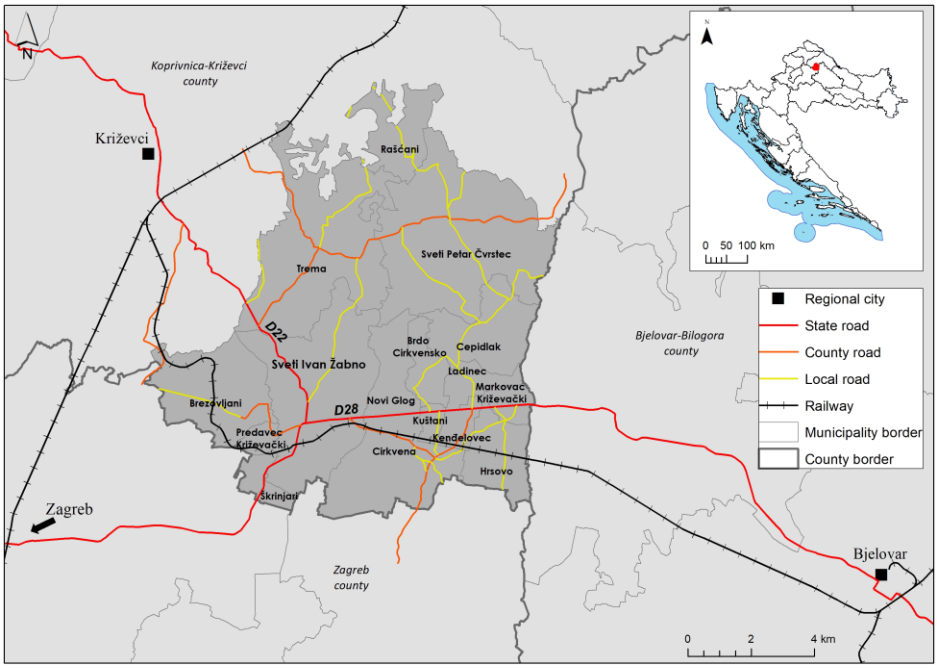

Figure 1: Transportation-geographical position of the Municipality of Sveti Ivan Žabno. Source: based on SGA, 2016.

The spatial distribution of transportation routes indicates that most of the main routes are located at the edge in the southern part of the Municipality (Figure 1). The state road D28 in the direction of Zagreb-Bjelovar is a road of great importance for daily migrants traveling to Zagreb from 4 counties (Virovitica-Podravina, Bjelovar-Bilogora, Koprivnica-Križevci and Zagreb) (Dokuš, 2004). The D22 connects Novi Marof, Križevci and Sveti Ivan Žabno and is important precisely because of the connection of the Municipality with Križevci. The center of the Municipality, the settlement Sveti Ivan Žabno, is 56 km from Zagreb, 20 km from Bjelovar and 11 km from Križevci. The deterioration of county, local and unclassified roads is one of the infrastructural weaknesses (MSIŽ, 2019).

The average annual daily traffic on D28 emphasizes its importance (Table 1). Over 6,000 vehicles have passed through this section in recent years, and the number is even higher in summer. In 2019, on average, most cars passed up to 5,332 per day, followed by 477 trucks daily and 52 buses daily (Hrvatske ceste, 2020).

The deviation in average summer daily traffic is due to the opening of a new section of the highway nearby. According to the average hourly traffic per day, the number of vehicles increases sharply from 4 to 7 a.m. when it reaches 400 vehicles per hour.

After that it stagnates until 3 pm, then it rises to a maximum of about 500 vehicles at 5 pm (Hrvatske ceste, 2020), all of which coincides with the working hours of most employees. During the week, the highest traffic intensity is on Fridays and Sundays, as employees, pupils and students return home on Fridays for the weekend and return to work or study in Zagreb and its surroundings on Sundays. Thus the transit characteristic of the Municipality's location can be noted.

Table 1: Average annual and summer daily traffic in Sveti Ivan Žabno 2010 – 2019.

Year	AVERAGE ANNUAL DAILY TRAFFIC (AADT)	AVERAGE SUMMER DAILY TRAFFIC (AADT)
2010	7399	7896
2011	7176	7352
2012	7461	8049
2013	7084	7273
2014	6620	6771
2015	6654	6833
2016	6899	7389
2017	6990	7199
2018	6965	7143
2019	6144	5829

Source: Hrvatske ceste, 2020.

The Bjelovar-Križevci railway passes through the Municipality of Sveti Ivan Žabno. Due to the great distance of railway stations from most settlements, rail transportation is used less for passenger transportation than road transportation (Urbia, 2005). The journey time is also less favorable compared to road transportation. The railway stations in the Municipality are located in the settlement Sveti Ivan Žabno and in Brezovljani, Škrinjari, Cirkvena and Hrsovo.

These settlements are located in the southern and south-western part of the Municipality, which indicates the location of the railway on the edge of the Municipality. It is expected that the situation will improve with the opening of a new railway line on the route Sveti Ivan Žabno-Gradec, because it will shorten the travel time, especially to Zagreb. Other settlements are connected by roads of lesser importance (Figure 1). With regard to transportation, the Municipality has a pronounced spatial polarization in terms of transportation characteristics, so that, depending on the distance from the main routes, areas with more

favorable and less favorable transportation characteristics can be distinguished. Due to the location of major routes in the Municipality, the settlements in the southern part of the Municipality are more densely populated, while those further away from the main roads are less densely populated (Figure 2). For example, Sveti Petar Čvrstec lost more population in the last inter-census period precisely because of the poorer transportation connectivity.

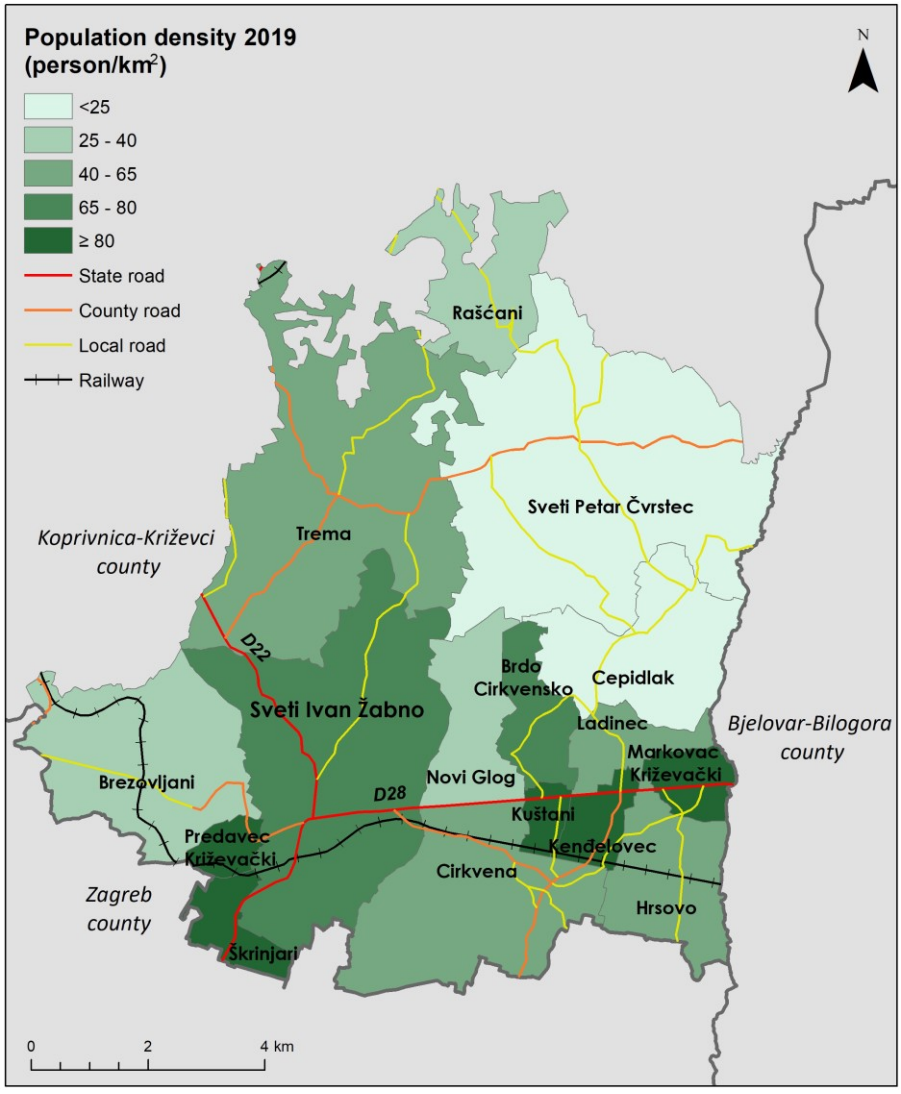

Figure 2: Population density and important transportation routes in the Municipality of Sveti Ivan Žabno in 2019.
Source: based on SGA, 2016; CBS, 2013b.

Using the method of linear extrapolation for 2019, it was calculated that 4,679 residents lived in the Municipality, about five hundred less than in 2011. If we look at the entire period of the census from 1857 to 2019, we can see that the population grew from the end of the 19th century to 1921 (Figure 3). The population growth was preceded by the opening of the Bjelovar-Križevci railway line. The railway induced industrialization and craftsmanship and thus the settlement of the area. Agriculture also developed, and Sveti Ivan Žabno became an important settlement (Šramek, 2002). Since the middle of the last century, the number of factories has been decreasing, deagrarisation and deruralisation are more intensive, so that the population is constantly decreasing.

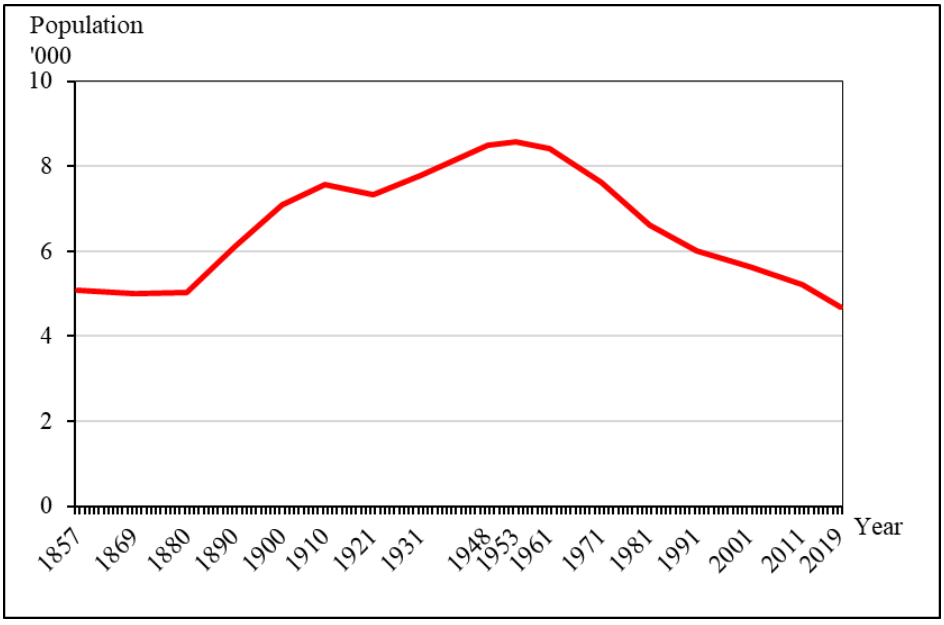

Figure 3. Population trend of the Municipality of Sveti Ivan Žabno 1857 – 2019. Source: Created in accordance with CBS, 2013b; CBS 2020.

The demographic situation in the Municipality is unfavorable due to the growing share of the older population (60 years and older), which makes up 25% of the total population (CBS, 2013b). The share of the young population (0 - 19 years), which makes up 22% of the total population, is declining (CBS, 2013b). The remaining share refers to the adults. The young and old people are age groups that are very vulnerable when it comes to participating in daily activities. At the same time, those over 60 years of age have the greatest difficulties in engaging in daily activities (CBS, 2013a). The share of residents with difficulties increases proportionally with the age of the population. The number of people in the Municipality of Sveti Ivan Žabno who need or use the help of another person also increases proportionally with the age of the population, with the residents

aged 75-79 years being the most dependent on the help of another person (CBS, 2013a). These problems will occur mainly in synergy with transportation problems, especially in parts of the Municipality that are far from the main transportation routes and public transportation.

4. Spatial differentiation of the impact of transportation

Following the interviews conducted, the main conclusions are presented in the first part of this chapter, while the analysis with regard to age groups and the way in which they participate in transportation is presented below. On the basis of the interviews, it was found that the impact of transportation differs precisely in these two segments due to the proximity of the main transportation routes.

Taking into account the roads, the respondents are satisfied with the existing transportation infrastructure in the Municipality. The transportation infrastructure does not hinder them in their daily obligations, as there are few macadam roads. However, the respondents along the D28 state road include the lack of pedestrian and bicycle infrastructure, which causes the lack of safety in participating in the daily transportation of the residents. The respondents point out that in the Municipality everything is accessible by car and that the existing transportation infrastructure is now adapted to the car. The respondents always prefer to use the car in the Municipality transportation system because of its comfort, independence of public transportation schedule, the possibility of direct arrival at the destination without having to walk from/to the public transportation station, waiting times can be avoided and planning is less complicated. The flexibility of road transportation is at a high level. In addition, more significant investments have been made in road infrastructure, while other modes of transportation are neglected.

"It is most convenient to use a car, as there is a lack of other infrastructure." (T.K., 46)

Therefore, respondents who use public transportation indicate that they need to plan more time for travel in order to adapt to the schedule. Sometimes this takes all day. The biggest problems with using public transportation in the Municipality are the reduced availability and lower frequency. The distance of about 1 km to the public transportation station is relatively easy to manage on foot. However, apart from the settlement Sveti Ivan Žabno, there are no pedestrian or bicycle paths that would make it easier or safer to reach the public transportation stations, which, moreover, are not sufficiently distributed in the study area (Figure 4).

Bus lines frequency is low and the price without discount is quite high. Discounts are intended for pensioners and pupils/students, but not for employed residents. They therefore prefer to use a private car. Public railway transportation is cheaper because of the discount. Furthermore, the train schedule is not changed often and respondents know when the train will arrive. However, the railway stations are not easily accessible for a large part of the population of the Municipality of Sveti Ivan Žabno.

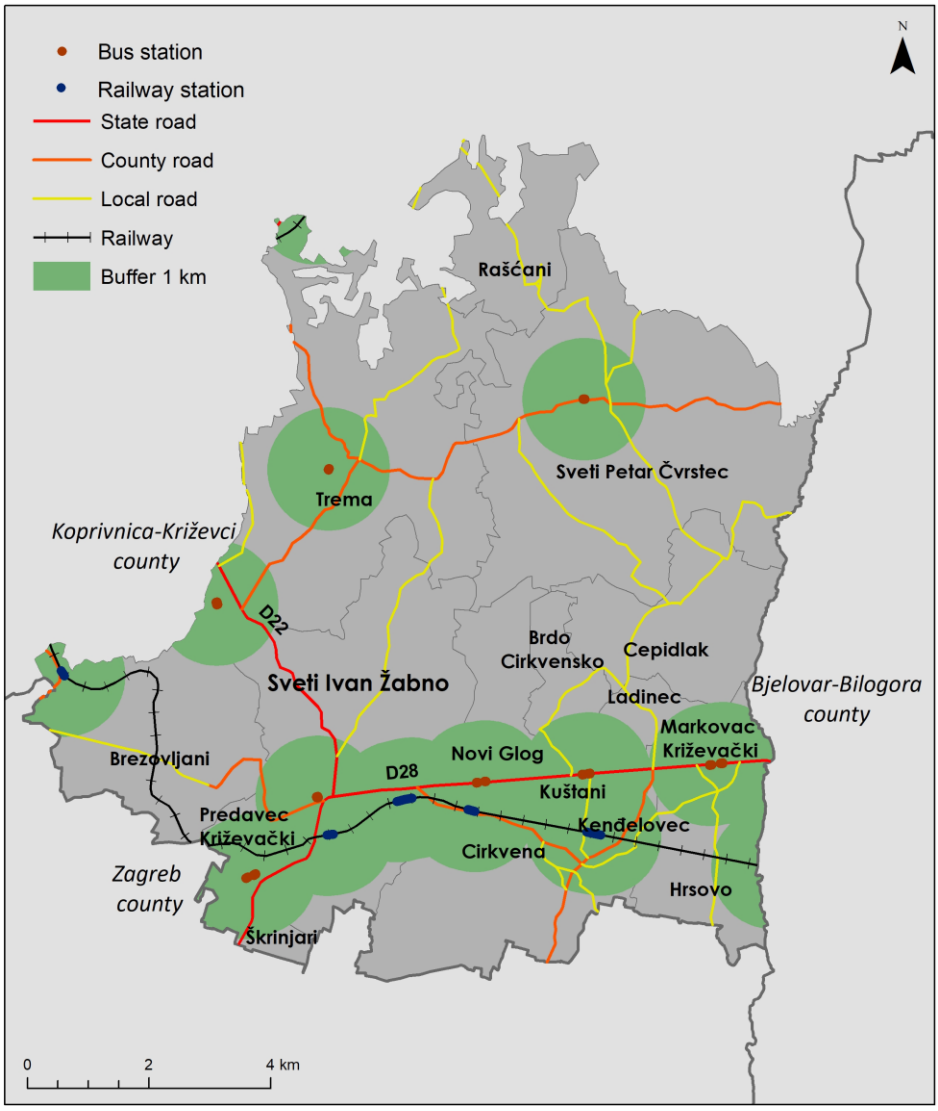

Figure 4. Distance of 1 km around public transportation stations in Sveti Ivan Žabno Municipality.
Source: based on SGA, 2016.

As for the connection and distance between settlements in Sveti Ivan Žabno Municipality, residents from the northern part of the Municipality (Trema, Čvrstec, Rašćani) rarely go to the center of the Municipality. In this area, the employed residents travel by their own cars and the pupils take the school bus every day. They travel to other settlements within the Municipality mainly to visit relatives and friends, while they carry out other obligations in Križevci.

The orientation towards Križevci is also justified by the existence of a bus line to Križevci with a frequency of four times a day, but also by the proximity of the city itself. The bus line Trema–Križevci is often used by older residents and people who need transportation to Križevci if they do not currently have their own car at home. The residents of Hrsovo, Markovac Križevački, Ladinec, Kenđelovac and other settlements along the main road mainly travel to Bjelovar. Although they now travel mainly by car, the direction remained traditional because of the bus lines that drove more frequently to Bjelovar (from the direction of Zagreb) than to Križevci, but they were mutually sparse due to the number of users deducted.

4.1. Differences by age groups

4.1.1. Young people

Young residents tend to emigrate for educational purposes or for extracurricular activities. For elementary school pupils bus transportation is organized and synchronized with their school schedule. However, the biggest problem young people face is attending other activities outside school hours.

"When I attended elementary school, we used to walk to the bus station about one kilometer from home and then took the bus to school. Sometimes our parents would drive us to school when we had an elective course." (L.R., 18).

The non-synchronized public transportation schedule and school schedule is the biggest problem secondary school pupils face as they have to travel to more distant towns to get to school.

"... when I attended secondary school, I could not volunteer where I wanted to because there was no train in the afternoon hours that I could board and go home. Whenever something happened in the afternoon, I could not participate because the train schedule was the restriction I faced" (M.M., 21).

To conclude, the young population is mainly dependent on their parents' transportation, especially in the northern part of the Municipality where the public transportation stations are far away or not available. Along the main state

road a safety problem is pointed out, especially when elementary school children walk to the school bus station.

In addition to education, social activities and evening outings are part of the daily life of young people, which is most often the case for the secondary school population. For young people from the northern part of the Municipality, access to these activities is difficult because there is no evening public transportation but they are again dependent on the transportation of their parents.

Young people along the main road and the railway have several evening lines to choose from to get to the nearest town. However, they all have a problem returning home as night public transportation is not available.

"Getting to Bjelovar was not a problem, but it was a problem getting back home because the first train leaves at 4 a.m. and it is not even safe to be on that train. Then one of my parents came to pick me up, or I stayed overnight at a friend's house. And you cannot wait for the train anywhere because the waiting room at the station is locked." (M.M., 21)

4.1.2. Adult people

The adult population in the Municipality is mainly employed. They usually travel by their own car because they have to go to work.

"It would be very difficult for me to adapt to public transportation according to working hours. In this case, when I finish work, I get in my car and be home in an hour. There is no waiting. It could cause me additional fuel costs, depreciation... but I can park my car at work. If I took public transportation, I would spend more time traveling than doing other activities." (T.K., 46)

Adult respondents also cite a safety problem, particularly in the care of children driving to school on a very busy D28 road.

"Every day you let your children go to school in fear. There are no sidewalks, some children have to cross the road, and there is no zebra." (V.S., 34)

4.1.3. Old people

The older residents have many problems while they have to manage the daily activities related to transportation. As they are often not able to use their own car, they are dependent on the transportation help of their children, friends, relatives etc. after prior organization and agreement.

"You are alone, you live alone, and then you have to make an agreement if you want to leave the house." (J.K., 68)

The older population living along the main state road has an advantage in terms of accessibility to the Municipality center and nearby towns, because they are closer to public transportation stations, while public transportation is difficult to reach for residents living further away from the main state road. The following quote emphasizes the struggle that older people in the northern part of the Municipality face when, due to their everyday obligations, there is no other option for them to participate in transportation than to use public transportation.

"If you do not have a car, children, relatives, there is a problem, there is a big problem. This is a struggle, they pray, beg or pay someone to drive them to Žabno. They cannot go to Žabno on their own because there is no way for them to go there, they have nothing to go by. The others go by bus to Križevci, and then they wait half a day until they come back when they have the suitable bus line. You lose all day because of the public transportation schedule." (B.H., 56).

The impact of transportation on the older residents along the main road is less favorable in terms of safety. Since they are less mobile, they encounter problems when participating in transportation along this road. Although public transportation stations are more accessible to them, they face dangerous situations caused by irresponsible drivers and the lack of adequate infrastructure for pedestrians.

"The irresponsibility of drivers! They overtake another vehicle, even if a pedestrian is moving towards them. The old people on the road annoy other participants, but if you want to get somewhere, you have to take public transportation to get to the station. If we had a sidewalk, it would be safer for children and everyone else." (Đ.Č, 65)

4.2. Differences by way of participation in transportation

The way of participation in transportation implies an active or passive participation of residents in transportation. Active participation refers to residents who participate in mobility by modes of transportation or who move around on foot, while passive participants are those who carry out other everyday activities (staying at home, resting, mowing grass, watching TV...) while transportation takes place around them. There is a difference along the main road and an area further away from it. The negative impact of transportation on the passive residents along the main roads manifest themselves in increased noise, vibrations, braking noise, stress caused by such situations and garbage, i.e. parts of cars or trucks on the private properties of the residents.

"Without PVC windows you cannot watch TV normally, you cannot even talk to your neighbor normally outside, the vibrations are noticeable." (K.K., 43)

In addition, traffic accidents occur more frequently along the state road in this part of the Municipality, which is a burden for both active and passive participants. Active participants point out that it takes longer for the road to get clear before they can enter the traffic.

"Sometimes we stand on the bridge for ten minutes. You cannot get out! There is a plain and a valley, the drivers speed up and do not ask anything. It gets denser, the traffic, there are careless drivers, they drive fast, all in all it's dangerous." (M.B., 66)

The responses also pointed to the insufficient, i.e. non-existent, space for pedestrian movement. This points to the problem faced by active participants along the main state road.

"While there are two trucks, but there is no space for a pedestrian on the road, you must get care to get away to a bridge or a ditch in time." (Đ.Č., 65)

In the northern part of the Municipality, away from the main roads, the impact of transportation is low. Transportation intensity is lower and therefore there is less noise, no crowd or fear for children as far as passive participants are concerned, while active participants have less problems getting into the traffic, traffic accidents are less frequent and less care is needed while participants are moving along the road than along the more frequent state roads in the Municipality.

5. Suggestions for improving the situation

In order to facilitate the daily life and the difficulties faced by the residents of the Municipality, it is necessary to shift the emphasis from road transportation, where cars stand out, to some other transportation mode. In this case, residents living away from the main state roads will have the opportunity to participate in transportation on an equal footing, regardless of the private car.

Accordingly, adequate public transportation should be organized. It should not just be the individual's need to get from one place to another. It is a necessity of modern times to promote sustainable development and a better quality of life for every resident, both in the Municipality of Sveti Ivan Žabno and beyond. The regularity and punctuality of public transportation, comfort, the presence of lines at a time when there are the most users and independence from weather conditions, which would be achieved by modernization, especially of railway

transportation, would contribute to more users. As the respondents themselves suggested, new bus lines with lower capacity must be introduced in less populated parts of the Municipality.

It is important to provide young people with reliable public transportation, with as few delays as possible for short or long distances without the need to rely on their parents.

In addition, bicycle and pedestrian paths, especially along the D28, would contribute to the safety of residents who use this section of the road on a daily basis and ensure better availability of public transportation stations. The paths should first be included in the spatial planning documentation so that their implementation can begin.

Educating local residents is also of crucial importance. It means informing them about some other mobility models. It should also highlight the advantages and benefits of sustainable ways of mobility, which could be achieved by holding workshops and lectures.

The proposal enhanced is to have police control on the frequent D28 to increase the wariness of all participants when participating in transportation on this section and to adapt the way of movement to the road conditions.

6. Conclusion

The study confirmed that transportation has a different impact on the population living further away, i.e. closer to the main transportation routes. As the main routes run through the southern and south-western part of the Municipality, the transportation intensity is higher and public transportation is better organised, the first hypothesis is confirmed. The differences are most obvious in the survey by age groups and active or passive participation in transportation. Young and old people have more difficulties in transportation than adults because they are dependent on the help of others, i.e. they depend on parents, friends, relatives in the transportation to carry out everyday activities. Since young people have the same problems in everyday travelling as old people, the second hypothesis was rejected. They are often unable to use the car, so that the impact of transportation on the main road is reflected in the lack of safety in mobility, and in areas away from the main routes, public transportation stations are difficult to access and public transportation lines are often inadequate. It can be concluded that the area away from the main transportation routes in the Municipality is transportation disadvantaged, as residents who do not have a car are limited in accessibility and have difficulties in carrying out their daily activities, and that young and old people are transportation disadvantaged social groups.

The obtained results are a contribution to a better knowledge of the impact of transportation on people's daily lives, especially for the Municipality of Sveti Ivan Žabno. The results can be applied in transportation planning, especially in spatial and social planning. The aim would be to improve people's quality of life and the demographic situation, reduce transportation disadvantage and ensure transportation and social justice for all social groups.

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