

IMPLEMENTING TRANSPORT STRATEGIES BASED ON SUSTAINABLE MOBILITY IN THE COUNTY OF VARAŽDIN

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Abstract: Sustainable mobility is one of the key challenges for further transport development and an increasing quality of life in urban areas. The European Union (EU) encourages its member states to develop transport strategies based on sustainable mobility through EU funds and involvement in various projects launched by the EU Initiative. The Republic of Croatia, as a member state, is still not sufficiently involved in the development of these strategies. Considering the division of the state into regions and counties, we examined the European directives related to sustainable mobility, reviewed examples of good practices in the Republic of Slovenia and then we drafted suggestions for introducing such transport strategies into the Development Strategy of the County of Varaždin. Taking into account the nature of a research paper, we used descriptive methods, compilation methods and deductive methods. With a detailed review of the directives and good practices of the current traffic situation in the County of Varaždin, we concluded that the main focus should remain on the development of cycling, public transport and railway as a means of carrying out freight logistics. It has been proven that the County of Varaždin has the potential to develop transport strategies based on sustainable mobility.

Keywords: European Union; sustainable mobility; Sustainable Urban Mobility Plans; the County of Varaždin; transport strategies

1 INTRODUCTION

Today, ecology plays an important role in all sectors of the economy, including traffic and transport development. Because of its increasing importance, The European Union (EU) is investing and requesting from its members to develop and modernize that area in the transport sector. EU directives and laws have clearly determined policies for the development of sustainable mobility in urban areas and their surroundings. All member states must respect these directives and laws. The Republic of Croatia, as an EU member, must adapt to the requirements and directives that the EU imposes as a priority. In this way, the state can develop in the required direction and solve the problems in the prescribed manner.

With the review of the Development Strategy of the County of Varaždin, we have found that sustainable mobility is not included in further development plans. By reviewing the EU directives, as well as the examples of good practices introduced in the municipalities of the neighbouring country Slovenia, we will be able to give clearer suggestions for the introduction of transport strategies based on sustainable mobility into the Development Strategy of the County of Varaždin.

We can see the importance of this research by the amount of directives that the EU imposes as a priority and numerous projects that have been or are still being implemented in order to reduce the adverse impacts of traffic and increase the quality of life for all residents of urban areas. Legislation has been committed to the following areas:

- intelligent transport services;
- road safety;
- "green" vehicles and fuel;
- cycling and motorcycling;
- urban mobility in general;
- environment [1].

With regard to intelligent transport services, the Directive 2010/40/EU of the European Parliament and of the Council was adopted on July 7, 2010. The Directive deals with the framework for the introduction of intelligent transport systems (ITS) in the road traffic area and mentions other modes of transport, associated with the multimodal transfer of information and planning [2]. Following the road traffic policy orientation 2011÷2020, the European Commission has launched the strategy for a safety analysis on national roads. Many examples of good practices, planning and actions for road safety have proven to be valuable for an exchange between the member states. The existence of the strategy for national road safety can be an indicator that traffic safety is an issue on the political agenda. This part of the legislation is divided into two parts. The first part of the analysis relates to the planning of the aspects and format of the strategy and the second part relates to the content of the action plan [3]. The legislation related to vehicles is very extensive. It covers "clean" and energy-efficient vehicles, "clean" fuels (the European alternative fuel strategy), emission standards for light vehicles, carbon dioxide emissions and other greenhouse gas emissions, fuel efficiency and other directives related to vehicles and fuels [1]. Taking into consideration cycling and motorcycling, we reviewed the Regulation 168/2013 which deals with the technical and administrative conditions for all new vehicles, separate parts and component technical units. These include two or three wheeled vehicles and mopeds whose purpose is driving on public roads, including those made in one or more phases and separate technical units, parts and equipment for the construction of such vehicles [4]. On December 17, 2013, the European Commission also announced "The Urban Mobility Package", whose main element is called "Together Towards Competitive and Efficient Urban Mobility". The appendix to this is the concept of sustainable urban mobility plans

(SUMP), urban logistics, access to all urban regulations, the development of ITS and the safety of urban roads [5]. It is also important to mention the Directive 2011/92/EU, which deals with the environmental impacts from public and private projects, including construction and installation works, plans and all other interventions in the natural environment, taking into account the exploitation of mineral resources [6].

The European Platform implements SUMPs and supports competitive sustainable mobility systems in European cities through further development of the SUMP concept and all the tools required for its successful implementation. It also provides a Portal of Mobility Plans for the dissemination of all relevant information and the facilitation of cooperation and coordination between various actions supported by the EU and the ability to exchange experiences, knowledge and contacts [7]. SUMPs represent modern and sustainable plans for urban mobility and transportation, including goals and tasks, a clear implementation plan and long-term vision, assessment of current and future effectiveness, integrated and balanced development of all modes, horizontal and vertical integration, access to participation, monitoring, review, reporting and quality assurance [8]. The most useful and most important tools for sustainable mobility planning are sustainable mobility marketing, SUMP effects measurement, applications of innovative transport measures and sustainable mobility indicators for cities. Funding through the EU can be divided into three categories: financing through the EU cohesion policy, financing through the European Investment Bank and other ways [9]. Numerous projects related to SUMPs have been implemented within the EU. The EU CHALLENGE project encourages mobility practitioners to improve the traffic planning process and the development of a quality SUMP concept. It addresses the challenges such as participation, collaboration, selecting measures, monitoring and evaluation [10]. The EU BUMP project provides the knowledge and skills needed for successful urban mobility planning in the cities and suburban areas of the partner countries. In addition to this, the EU BUMP project supports cities in developing their own SUMP concepts [11]. The EU Poly-SUMP project refers to the polycentric planning of sustainable urban mobility and is based on the development of such plans for polycentric regions [12]. The EU Tide project is focused on the development of the North Sea region, i.e. the area under a strong tidal influence, protected by European directives [13]. The EcoMobility-Shift project includes a methodology for measuring performance in urban mobility and making decisions related to the areas that needed to be improved. Shift methodology gives cities support in creating and strengthening their mobility plans and developing action plans for the implementation of integrated urban mobility [14]. From 2011 to 2013, the EU Quest project has developed quality management tools that help small and medium-sized cities in further development of their policies and actions for sustainable mobility [15]. The EU Advance project aims to improve urban transport systems in European cities. The project gives support to cities and municipalities on their path towards a more sustainable urban mobility and assists

them in the development of their SUMP concepts [16]. The EU PUMAS project offers solutions to the challenges of sustainable urban mobility through the co-ordination and development of the SUMP concept in the Alpine area [17]. The EU Solutions project offers solutions for the current and future soil and water pollution. The project is searching for new and better solutions, tools, methods and models of support in the land and water protection decisions [18]. The CIVITAS Initiative is a platform for the exchange of ideas and experience in the field of sustainable urban mobility. In some cases, challenges are technical and logistical, while others need extensive citizen involvement to achieve change. Currently, the CIVITAS Initiative has several different projects related to sustainable mobility, categorized into three categories. There are joint projects or demonstration projects, knowledge-based research projects and support projects [19]. The EU Endurance project is helping cities and regions to develop their SUMP concepts through the facilitation of networking, learning and sharing experiences and best practices in all countries [20].

Considering the results achieved in Ljubljana, Maribor and Ljutomer and the examples of good practices not only in the mentioned towns and municipality, but through the entire country, the Republic of Slovenia proved to be extremely successful in this sector.

It is also important to note that the County of Varaždin and the City of Varaždin (main centre of the County of Varaždin) aim to increase the development of bicycle traffic and cycling infrastructure both in the centre of Varaždin and other county towns, as well as in the rural and more distant areas of the county. The city bus station has been repurposed into a fast food restaurant, while the concession for the city bus transport belongs to a company named "Vincek autobusi". The suburban and interurban bus traffic is insufficiently developed, making it difficult to travel from the rural areas of the county. There is also insufficient use of the railway traffic, which could reduce the burden on the urban and suburban roads from freight vehicles. From the aspects of road safety, together with the County of Varaždin Police Administration, the County of Varaždin took concrete measures, which helped the county to achieve significant success in raising the awareness of road and traffic safety.

We are interested in the following: types of EU directives regarding sustainable mobility, how they work in practice and whether sustainable mobility can be included in the Development Strategy of the County of Varaždin. We have set the following hypothesis: The County of Varaždin has a predisposition to accept sustainable mobility based on transport strategies. We will prove the hypothesis by reviewing the current traffic, mobility and transport situation in the County of Varaždin.

2 METHODS

At the very beginning we set the assumptions about the impact of traffic on the Earth's atmosphere, carbon dioxide emissions and the interests of the County of Varaždin. The scientific process began with an overview of the status and

legislation at the EU-wide level. The next step was a presentation of the methods followed by solutions divided into two categories. The first category refers to SUMP in the Republic of Croatia and the Republic of Slovenia. What is reviewed is the current state of sustainable mobility in both states. Next to that, key projects are presented, examples of good practices and future plans. The second category refers to the County of Varaždin itself, where we described the county, demographic situation, traffic development and connectivity. The collected data were analysed and based on that, analyses were provided, as well as the suggestions for the introduction of sustainable mobility based transport strategies into the Development Strategy of the County of Varaždin. The last part covers the conclusions.

As the main sources of legislation we used the Eltis organization website, the aforementioned directives and regulations of the EU, the main websites of the cities and municipalities of the Republic of Slovenia, as well as the main websites of the County of Varaždin and the City of Varaždin. The area of traffic development and connectivity in the County of Varaždin has been defined by a review of the current situation and we contacted the Development Agency North and the County Road Administration, where they referred us to the County of Varaždin Police Administration. By reviewing the current situation and the mentioned contacts, we can more closely define the traffic image of the County of Varaždin and the City of Varaždin. Throughout the research process, we used the description and compilation methods, as well as the deductive method. All collected data were analysed, and based on the analysis, we prepared suggestions for the introduction of sustainable mobility based transport strategies into the Development Strategy of the County of Varaždin.

An overview of the research step by step:

- the first step: a review and presentation of the EU legislation;
- the second step: a review and presentation of the European platform, SUMP and its tools;
- the third step: a review and presentation of the projects implemented in the field of sustainable mobility;
- the fourth step: a presentation of methods and the hypothesis;
- the fifth step: spatial planning in the Republic of Croatia;
- the sixth step: spatial planning in the Republic of Slovenia;
- the seventh step: a description and demographic situation of the County of Varaždin;
- the eighth step: traffic development and connectivity of the County of Varaždin;
- the ninth step: a collected data analysis;
- the tenth step: proposing solutions;
- the eleventh step: conclusions.

3 PRESENTATION OF RESULTS

The results include the SUMP development in the Republic of Croatia and the Republic of Slovenia, as well as

an overview of the current situation, traffic development and connectivity in the County of Varaždin. They also include an analysis of the collected data and suggestions for the implementation of sustainable mobility based strategies into the Development Strategy of the County of Varaždin.

3.1 SUMP in the Republic of Croatia

In the Republic of Croatia there is no legal definition of the SUMP concept, a national guidance for its preparation, or a connection with the national sources of funding. However, the state has defined the goals of sustainability and the political support for SUMP, but public participation and the technical capacity for its preparation are very limited. In 2014, a public hearing on the SUMP concept and project was conducted at the Faculty of Transport and Traffic Sciences, where it was found that there is a lack of coordination between the local, county and state level [21]. The current situation in the country is defined as follows:

- according to the data from 2012, there are 336 registered personal cars per 1,000 inhabitants;
- the need to "rejuvenate" the fleets and the use of high-quality fuel for driving;
- the need for catalytic converter vehicles;
- compared to 1990, carbon monoxide emissions decreased by 70 %;
- compared to 1990, nitrogen oxide emissions decreased by 22 %;
- compared to 1990, lead emissions were reduced by 94 %;
- compared to 1990, the number of passenger cars increased by 80.4 %;
- compared to 1990, the number of heavy duty vehicles increased by 2.2 %;
- compared to 1990, the number of light duty vehicles increased by 7.2 %;
- compared to 1990, the number of motorcycles and mopeds increased by 10.2 %;
- compared to 1990, fuel consumption in road traffic increased by 62 %;
- diesel fuel is twice more used than gasoline [22].

In the period from 2012 to 2025, national forecasts foresee a growth in greenhouse-gas emissions caused by traffic. For this purpose, the Transport Development Strategy has been developed, with the aim of developing an efficient and sustainable transport system in the Republic of Croatia. All measures are in line with the EU regulations. The mentioned measures are the following:

- ensuring the interoperability of the system;
- increasing the level of service ability in the transport sector;
- improving energy efficiency;
- financial sustainability assurance;
- security and protection;
- ensuring social and environmental sustainability;
- efficiency ensuring;
- improving accessibility and social inclusion;

- improving the distribution of traffic patterns in favour of public transport;
- improvement of the environmentally acceptable and alternative modes of transport;
- quality service assurance [23].

It is also important to mention the participation of the Republic of Croatia in two EU projects, the Adria.Move IT! and CIVITAS Dyn@mo projects. The Adria.Move IT! project was co-funded by the 2007–2013 IPA Adriatic CBC Programme. The project brought together the Adriatic coastal towns that have been facing mobility issues due to their specific historical and spatial circumstances. Traffic congestion is the result of the historical heritage of such cities as they were not designed to use cars and were not prepared for a sudden increase in the number of inhabitants during the summer tourist season. The motive to launch the project was a joint development of efficient, environmentally friendly, safe and healthy transport solutions that could stimulate sustainable transport, an increase in the quality of life and the socioeconomic cohesion of the project area. The project is a good example for other Adriatic local authorities. In order to promote sustainable mobility, small pilot projects have been implemented in partner cities, aimed at encouraging cycling and alternative transport channels [24]. CIVITAS Dyn@mo is an ambitious project with a strategic significance for sustainable mobility planning in four dynamic European cities. It includes two leading cities, Aachen in Germany and Gdynia in Poland, and two learning cities, Mallorca in Spain and Koprivnica in Croatia. The mission of this project is to strengthen sustainable mobility through the promotion of non-polluting lifestyles, the fostering of social interaction and co-operation on the basis of new media and the integrated implementation of innovative transport services for citizens of all ages. Strategic objectives of the project are the development of the "Mobility 2.0" system and service through the implementation of 2.0 technologies, solutions for the electric mobility of citizens, the use of new electric and hybrid vehicles and the inclusion of a dynamic citizen dialogue in mobility planning and service improvement. The objectives are divided into four levels, which are the strategic, technical, service and European level [25].

So far several cities have participated in the projects related to SUMP. The cities are Dubrovnik, Umag and Novigrad for the Adria.Move IT! project and Koprivnica for the CIVITAS Dyn@mo and CH4ALLENGE projects. Dubrovnik, as a popular tourist resort, faces problems of overcrowding due to the lack of parking spaces, excessive use of cars, traffic congestion and unregulated cycling and pedestrian paths. Within the framework of the IPA Cross-border Cooperation Program and Adria.Move IT! project, a local Mobility Plan was created, modern urban equipment was installed at key locations in the city and outside the centre, bicycle holders were installed at the Sport Centre and near the city core, and all pedestrian paths were renovated and marked. Moreover, Dubrovnik owns a 3.5 km long pedestrian and cycling route that connects the

residential and tourist area with the north-western part of the city. This has significantly contributed to the development of the city as a tourist resort. In the city of Umag, there is a cycling path called Umag-Ungarija, which is a 2.5 m wide and 921 m long asphalt road, equipped with traffic and information signalling. In Novigrad, there are two walking and cycling paths over 11 km in length, called the Dalja-Maleda-Pineta-Karpinjan and Kršin-Stancija-Vinjeri-Novigrad paths. Novigrad is thus succeeding in boosting its sustainable mobility, leading to a reduction in the number of motorised vehicles in traffic. We also have to mention a pilot project of the municipality of Lopar, which is about building a pedestrian and cycling trail on the already existing route that connects Sveti Rok and Jamin. The purpose of the project is to reduce the congestion in road traffic, preserve natural resources and limit the use of vehicles [26]. It is important to mention the City of Koprivnica, which, within the CIVITAS Dyn@mo project, has adopted six measures:

- public transport planning;
- sustainable urban transport plan;
- university campus of zero nitrogen oxide emissions;
- low-emission public transport;
- development of sustainable traffic curriculum for the University of Koprivnica;
- common use program for urban electric vehicles [27].

In order to improve the implementation of SUMP and increase sustainable mobility, many pilot studies have been conducted, and their results gave an insight into the themes and their percentage share in the presented sustainable mobility plans. Tab. 1 shows the topics and their percentage share [28].

Table 1 Topics and their percentage share in the sustainable mobility plans of the Republic of Croatia

Topics	%
Walking and cycling	14.1
Public urban transport	13.4
Integrated traffic system	10.8
Parking control	7.2
Delivery in towns	6.2
Compliance of the urban development and land use	6.2
Access Restrictions Schemes (green zone, reduced gas emission zones, congestion charge)	6.2
Compliance with the traffic plans at the county, national and EU levels	5.9
Ways of citizens' and other participants' participation	5.6
Accessibility, social inclusion (young, old, disabled)	5.2
Evaluation procedures, evaluation of the plan	3.9

3.2 SUMP in the Republic of Slovenia

There is no legal provision in the Republic of Slovenia that would force the local authorities to implement SUMP, but in the last decade, a concept has been developed, mainly through the EU projects. The Slovenian experts tested SUMP through three levels, recommended by the EU, such as the size of the city recommended by the EU (+ 100,000), the size of small municipalities and regions. The concept proved to be successful at each level. The SUMP, adjusted

to the regional level, was developed only for the area of Nova Gorica, while all other SUMP concepts were developed for municipalities. Several years ago, the Ministry of infrastructure, responsible for the urban transport, recognized the value of the SUMP concept and supported it on several levels. The priority of the government is the development of a National Platform for Sustainable Mobility. The Ministry of Infrastructure has also established cohesion funds that serve as a source of funding for the development of SUMP in cities and the implementation of all sustainable measures under this concept [29]. The current situation in the country is defined as follows:

- EU access has raised the use of road traffic by 70 %;
- 500 km of railway lines are electrified;
- the ratio between the road freight transport and rail freight transport is 71:29;
- the share of combined transport is 0.8 %;
- more than 75 % of individual travel in the state is performed by personal cars;
- public passenger transport is used in a 25 % share;
- the total length of roads is 85,220.00 km;
- the total length of railway lines is 2,177.50 km;
- road traffic caused 90 % of harmful emissions;
- the number of traffic accidents is around 38,000 per year;
- spatial planning documents are mainly focused on the infrastructure [30].

It is also important to mention integrated traffic planning based on the development of transport strategies. The process of preparing integrated transport strategies involves a sustainable and holistic approach, a clear vision and goals, a focus on achieving measurable goals, an overview of all transport costs and benefits and staff expertise based on the use of measures that have been tested.

There are the so-called guidelines for the development of sustainable urban mobility plans, prepared for Slovenia in line with the experience gained in the preparation of the integrated transport strategies for Ljubljana, which have been implemented within the CIVITAS Elan project and in the development of the integrated transport strategies for the Ljutomer municipality, covering 11 following steps:

- foundation setting;
- defining the process;
- state analysis and scenario design;
- a scheme of a required state;
- defining priorities;
- selecting measures;
- making a performance plan;
- establishment of supervision;
- acceptance of the strategy;
- implementation of the strategy;
- learning from experience [31].

Each of the mentioned steps has certain sub-processes and additional tasks that need to be completed in order to take the step successfully.

Some of the most well-known projects related to SUMP were conducted in Ljubljana, Maribor and Ljutomer. Ljubljana has participated in two CIVITAS projects, Mobilis and Elan. Maribor is the second largest city in Slovenia and has developed a Sustainable Urban Transport Plan. In 2012, the Ljutomer municipality accepted a traffic strategy which was rated as the most successful in Europe [32].

The results of the Mobilis project in Ljubljana have shown that biodiesel is not a competitive and cost-efficient fuel. Public transport buses, adjusted to this fuel, demanded twice more maintenance. Although the results proved to be negative, 20 buses adapted to biodiesel are still in use and Ljubljana, on the basis of the project, has made firm partnerships with the involved institutions [33]. Besides Mobilis, Ljubljana also participated in the Elan project. Within the Elan project, the SUMP upgrading measures were implemented. The project also provided real-time information, transport according to demand, e-ticketing and a public transport portal, green procurement for city fleets and clean plant propulsion [34]. In 2000, Maribor adopted the concept of spatial development with its goals. The goals are a sustainable urban development, establishing links between the rural and urban areas, preserving the environment and improving the quality of life in the town. In 2008, the Municipal Environmental Program was adopted with a detailed action plan for urban mobility and in 2009, a sustainable energy and climate change was mentioned within the local energy concept, which included a detailed action plan for reducing energy consumption in transport [35]. Maribor has set the strategic objectives that it wants to reach by 2020. The city wants to become the leading municipality in Slovenia in terms of sustainable mobility, to limit noise and pollution levels in line with the EU directives, to reduce the number of traffic accidents and injuries by 50 % (period from 2008 to 2013) and balance travel patterns [36]. The city has also been included in the TRAMOB project, which has been successfully implemented in order to reduce the trend of deterioration of the quality and efficiency of mobility [37]. It is also important to mention the municipality Ljutomer. Ljutomer has implemented its integrated transport strategy to address the five challenges in the municipality, which is a shortage of the planning practice, unhealthy travel habits, a drop in the public passenger transport, poor conditions for walking and cycling and a lower quality of life caused by road traffic. Ljutomer has initiated a national project for the establishment of the SUMP, which include the strategic pillars of sustainable mobility planning, integrated promotion of walking, use of the potential for cycling, attractive public transport and optimization of road traffic [38]. The transport strategy was successfully implemented through the Ljutomer municipality.

Ljubljana, Maribor and Ljutomer are some of the examples of how to successfully import sustainable mobility and its aspects into the system. The Republic of Slovenia can boast numerous examples of good practice, not only in the mentioned cities and municipality, but

throughout the country. The following are some of the examples:

- free local transport – Kavalir (Ljubljana);
- free local bus (Velenje, Nova Gorica, Murska Sobota);
- extension of the bus line to the suburbs (Grosuplje and Brezovica);
- a dead end street with pedestrian and cycling passes (Ljubljana);
- two-way passage of cyclists in one-way streets (Ljubljana);
- a narrowing of the carriageway (Ljubljana);
- common traffic space (Ljubljana);
- the so-called pedestrian bus and bike train;
- a connection of a regular and school bus line (Grosuplje);
- free transportation for the elderly (in a region called Obalno-Kraška);
- traffic island (Reteče);
- travellers – Prevoz.org (established at the University of Ljubljana);
- sustainable mobility in Kranjska Gora;
- soft mobility in Bohinj;
- sustainable mobility at the Ski-jumping World Cup (Planica);
- sustainable mobility at the European basketball Championship Eurobasket 2013 [39].

3.3 Information about the County of Varaždin

The County of Varaždin is located in the northwest of the Republic of Croatia and borders with the County of Krapina-Zagorje, the County of Koprivnica-Križevci, the County of Međimurje and the Republic of Slovenia. The county area amounts to 1,261.29 km² and includes 302 villages and six cities. Those cities are Varaždin, Ivanec, Lepoglava, Varaždinske Toplice, Ludbreg and Novi Marof. Additionally, the county includes 22 municipalities. The centre of the county is the City of Varaždin and the population of the county is 175,951 inhabitants [40].

3.3.1 Traffic development and connectivity

The County of Varaždin has several important roads, such as the Goričan-Varaždin-Zagreb highway, the state road D-2, also well-known as "Podravska magistrala". Moreover, the fast road Varaždin-Ivanec-Krapina and the fast road in Podravina linking Ormož, Varaždin and Virovitica are being constructed. Regarding railway traffic, 91,751.00 km of railway lines pass through the county. All lines are single-track, without electrification, intended for mixed traffic. The permissible speed varies from 45 to 100 km/h. When all the positive and negative features of the transport infrastructure are summed up, there are some needs in terms of improving road infrastructure for the purpose of passenger safety, modernization in railway traffic and in terms of improving the infrastructure in the public transport [41]. Looking at the City of Varaždin, some of the most important roads are already built. Those roads

are an Eastern bypass connecting Hungary and Čakovec, the Western bypass connecting the settlements Gojanec and Hrašćica and the Southwestern bypass connecting the settlements Gojanec and Knežinec [42]. It is known that the most common types of transportation in Varaždin are personal vehicles, public transport, bicycles and walking. In the morning hours, there are 5,880 passengers in personal vehicles, 2,450 passengers in public transport, 980 cyclists and 490 pedestrians [43]. The city has solved the potential parking problems by building several large parking locations, including the underground garage at the Capuchin Square, with 446 parking spaces and three other parking locations. The first of the bigger parking spaces is located at the so-called Banus place, the second one is located at the Faculty of Organization and Informatics (building 2) and the third one is located at the Varaždin Cemetery. The city has several electronic devices to display free parking spaces. Varaždin also owns several objects similar to traffic islands, installed to reduce the critical speed and to increase traffic safety.

3.3.2 Mobility of people

The line transport of passengers in Varaždin was conducted by company named "Autobusni promet d.d.", which ended up in bankruptcy, while the city bus station was converted to a fast food restaurant. Concession for conducting line transportation was taken over by the company named "Vincek autobusi". Regarding the taxi services, in 2014, the Cammeo Group's taxi service arrived in the County of Varaždin. Due to the frequent unadjusted speed and accidents ending with an injured pedestrian, the centre of the city was turned into a pedestrian zone divided into two parts. The narrow part consists of the Street of Ivan Gundulić, King Tomislav Square and Franciscan Square, as the narrow centre of the city; while the wider part is divided into the streets and squares of a broader centre of the city. In 2014, it was decided that riding a bicycle in certain parts of the pedestrian zone would still be permitted, but not faster than a pedestrian walk. Towards the centre of the city, on the Street of Zrinski and Frankopan, near the bus station of the "Autobusni promet Varaždin", is a two-way bicycle path, with a total length of about 100 m. The path is clearly visible and color-separated from the pedestrian path and the carriageway. If the cyclists want to arrive from one part of the city to another, they cannot shorten their journey through the centre because of a strict cycling ban, but have to cycle around the centre, on marked cycling paths. The City of Varaždin, as the so-called "Bicycle Town", in some locations still does not have an adequate cycling infrastructure and the accompanying signalling. Several tourist cycling routes go through the county, but the county still does not have the option of renting bicycles for tourist purposes. Apart from this, the city has several smaller bicycle parking lots, most popular in the Alojzije Stepinac Street. There is no covered parking space for bicycles.

3.3.3 Ecological factors and road safety

No significant exceedance of harmful greenhouse gases has been noted in the County of Varaždin. However, their greatest influence is seen in the urban areas of the county. For the sake of environmental protection, within the strategic objective of environmental protection, the rational space management and infrastructure development, the priority lies in environmental protection, which emphasizes the importance of addressing the problems of the reduced air quality in the county's urban areas [44].

As a result of an increased number of traffic accidents during 2016 and 2017, camcorder boxes for measuring the speed of vehicles were set up at seven locations in the county (mainly near the City of Varaždin). The County of Varaždin Police Administration owns two cameras that are constantly moving from one location to another. According to the data from the County of Varaždin Police Administration, the County of Varaždin is included in the National Road Safety Program which finances the repair of dangerous traffic spots. The police administration has also carried out numerous actions to increase the awareness of safety, such as making a list of children cyclists carrying helmets, placing promotional commercials for wearing reflecting jackets and establishing the Road Safety Council. The Council initiated the pedestrian crossing lighting action. The pedestrian crossing lighting is based on solar cells, LED lamps and battery cells. The Council has also launched a campaign that involves citizens in the making of road safety decisions.

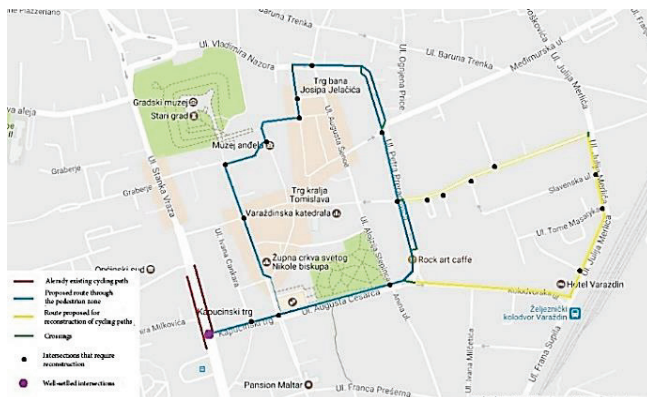


Figure 1 Proposed cycling route through one part of the pedestrian zone in Varaždin

3.3.4 Possible solutions

Regarding the road infrastructure, the County of Varaždin and the City of Varaždin are well equipped. There is a need to work on the development of railway transport for the purpose of freight logistics. This action could reduce the burden on city roads from freight vehicles. Parking problems in the city are well-solved. We propose the construction of traffic islands at some of the critical locations in the county which will also help reduce the number of accidents. For the purpose of the cycling encouragement, recreation and justifying the name "The

Bicycle Town", what is proposed is a construction of a two-way cycling route through one part of the pedestrian zone, as well as a reconstruction of the existing cycling paths and a construction of new ones on certain locations. What is also proposed is the import of bicycle rental opportunities at the County of Varaždin Tourist Board. By implementing a two-way cycling route, we believe that the violations of the cycling ban through the centre of the city can be reduced, as well as the travel time from one part of the city to another. Moreover, the quality of life in the city and the pleasure of all Varaždin bikers can be increased. Figure 1 shows the proposed cycling route.

The reconstruction of the city bus station and the implementation of environmentally-friendly bus vehicles for urban traffic are also suggested. In addition to this, we suggest an increase in the number of routes and frequencies in passenger transportation to the suburban villages of the county. Regarding the security that is well-solved in the county, the County of Varaždin Police Administration has put forward several proposals for its increase, such as the changes in the behaviour of traffic participants through the organization of driver awareness campaigns, investments in further development of the infrastructure, a development of safe vehicles and an improvement of medical care. Considering the already set strategic objectives and their priorities, it is necessary to formulate proposals that can be integrated into the existing vision and strategy of the County of Varaždin. It is also necessary to include other participants at the state and county level. At the state level, we recommend including the Ministry of Maritime Affairs, Transport and Infrastructure, project companies and media and other interested groups. At the county level, we recommend the inclusion of the County of Varaždin, the City Council of the City of Varaždin, the Development Agency North, the association "Varaždin bikers", the County of Varaždin Police Administration, the municipal boards of all interested municipalities of the County of Varaždin, the public transport service provider "Vincek autobusi", educational institutions, the Society of the Dystrophic, Cerebral and Polio Invalids and Other Physical Invalids of the City of Varaždin and all other interested groups. The project's holder should be the County of Varaždin authorities, which would conduct interviews with all other interested groups. Five strategic goals have already been set in the Development Strategy of the County of Varaždin. Taking all that into consideration, we propose the introduction of two new strategic goals, as well as the subsequent priorities. The strategic goal 6 is connected to the renewal of the traffic infrastructure. This goal includes two priorities. The first priority is the development of the railway infrastructure and the second priority is the development of a cycling infrastructure and superstructure. The strategic goal 7 is connected to the development and renewal of bus traffic. It also includes two priorities. The first priority is the development of bus traffic in Varaždin and the second priority is the development of intercity bus transport. Measures for both strategic goals should be formed according to the set priorities.

Within the third strategic objective, which is the Environmental Protection and Energy Management, what is proposed is the import of priorities related to the improved greenhouse-gas emissions control and repair of locations exposed to the harmful effects of traffic noise. The EU funds could cover the costs of projects related to sustainable mobility. Some of the money sources can be innovative actions and sustainable urban development that cover and test pilot projects and the trans-European transport networks such as TEN-T which includes interoperable railways and sustainable transport promotions. Some of the money sources are also loans and guaranties from the European Investment Bank (projects over 25,000,000.00 euros), the ELENA program which covers 90 % of the technical costs for the preparation of projects related to renewable energy sources, the JESSICA program which also covers the costs of sustainable development, the European Energy Efficiency Fund, the LIFE program which is a financial instrument for the environmental and climate change actions.

4 CONCLUSION

By reviewing the available literature, it is concluded that the Republic of Croatia is lagging behind the neighbouring Republic of Slovenia with regard to the development of sustainable mobility. It is necessary to mention that significant changes and development efforts in accordance with the EU directives in the case of the Republic of Croatia have only been noticed in the City of Koprivnica which is continuing with the development in this direction. On the other hand, the Republic of Slovenia is actively involved in the development through Ljubljana, Maribor and Ljutomer, and it provides the examples of good practice throughout the country.

Regarding the County of Varaždin, through a review of the Development Strategy of the County of Varaždin and the City of Varaždin, by talking to key stakeholders such as the County Road Administration and the County of Varaždin Police Administration, it is concluded that the County of Varaždin has the predispositions for further development of cycling and for the improvement of conditions for cyclists, which then leads to increased tourism and quality of life. Further development of bus traffic is also much needed. However, all discussions and meetings related to this topic did not bring any positive conclusions. All the presented results and solutions can be linked to the EU directives on clean transport and cycling encouragement. The exception that we did not deal with through reviewing the EU directives is the development of railway traffic, but in the case of the County of Varaždin, the development of railway traffic could save city and county roads from freight vehicles.

These solutions can bring various advantages such as:

- increasing the quality of life in the County of Varaždin;
- encouragement of physical movement;
- reduction of greenhouse gas emissions in the atmosphere;
- increasing the satisfaction of the population;

- facilitating the travel of people from rural areas or distant places;
- reducing congestion caused by personal cars;
- development of the so-called "Healthy Region";
- development of the County of Varaždin in accordance with the EU directives;
- contribution to the development of the entire Republic of Croatia.

Taking all of the above mentioned into account, the strategic goals based on the needs of the County of Varaždin are formed. Moreover, taking into account the logistical side of our research, it is concluded that there is a lack of a more detailed economic analysis, i.e. an overview of all costs that follow the innovations and that need to be done.

Sustainable mobility is the future of a better aggregate functioning, especially in the urban areas.

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SYMBOLS AND ABBREVIATION

EU	European Union
SUMP	Sustainable Urban Mobility Plans
ITS	Intelligent Transport Systems
TEN-T	Trans-European Transport Network

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