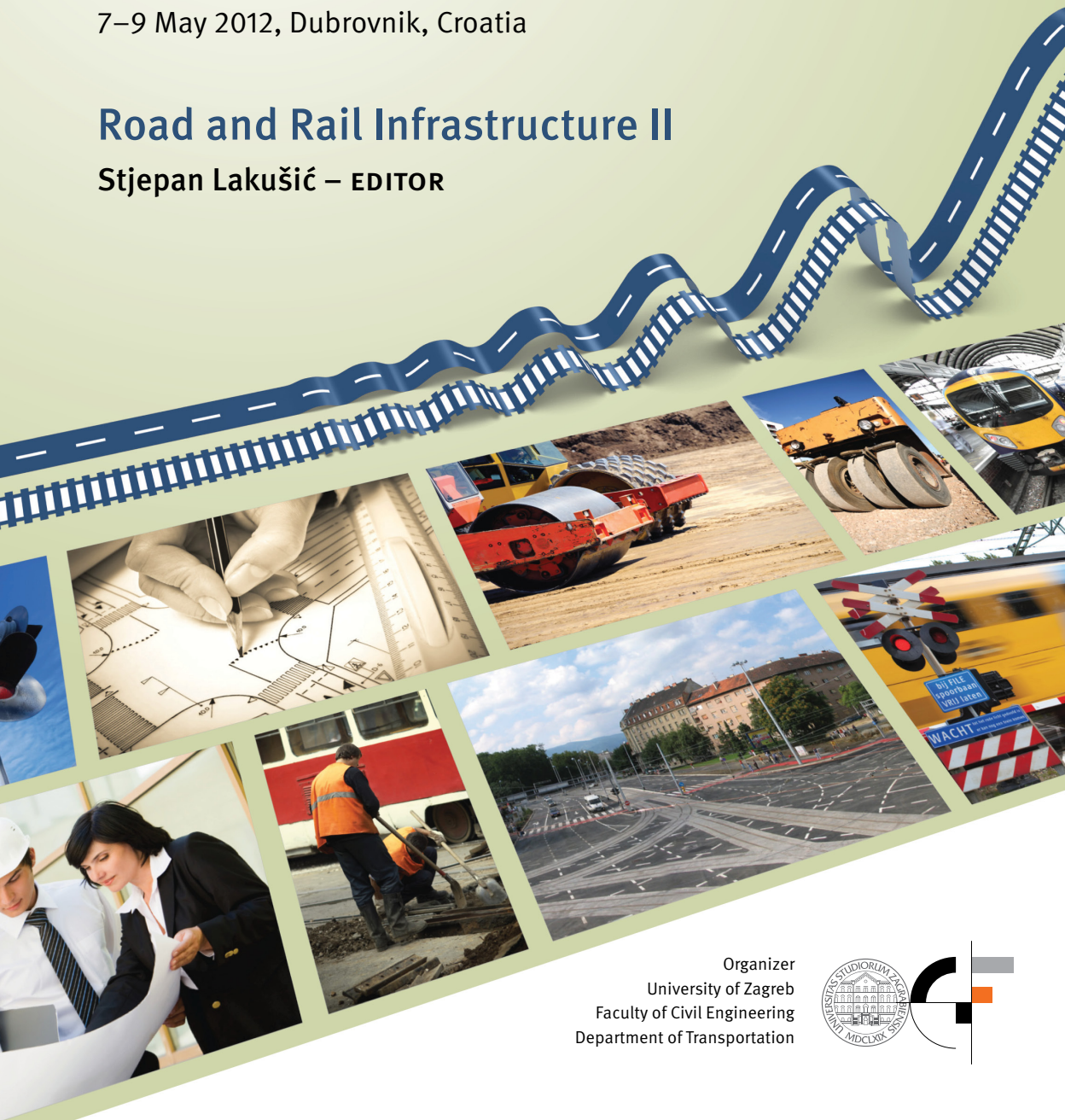
CETRA 2012

2nd International Conference on Road and Rail Infrastructure
7–9 May 2012, Dubrovnik, Croatia

Road and Rail Infrastructure II

Stjepan Lakušić – EDITOR



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PROGRAM FOR DEVELOPMENT OF BICYCLE TRAFFIC IN THE CITY OF ZAGREB

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Abstract

The City of Zagreb, like most of the European cities and cities in developed countries, experienced a rapid motorized growth. On a long term, this cannot be successfully solved by building an infrastructure which is exclusively designed for individual motorized traffic. By following recommendations and guidelines of the European Commission, relating to the future sustainable development of cities and the mobility of their inhabitants, as well as positive examples of European cities and regions, the City of Zagreb, in the last 10 years, increasingly commits to and directs the development of alternative forms of transport. This primarily refers to urban public passenger transport and the development of bicycle traffic. Taking this into account, this paper contains a review of previous program activities and future plan actions relating to the development of bicycle traffic in the City of Zagreb, mainly relating to: development and arrangement of bicycle traffic network, establishment of a public bicycle service, innovation and adaptation of legislation related to design of bicycle paths and lanes, and general safety of bicycle traffic.

Keywords: bicycle path / lane, bicycle rack, public bicycle service, legislative regulations, European and international examples and guidelines

1 Introduction

In recent years, City of Zagreb, as most European and world capitals, increasingly experiences negative consequences of a permanent increase in the volume of individual motor traffic. This ultimately results in increased noise, emissions of toxic gases and significant deterioration of climatic conditions and quality of life of its citizens.
Despite the continuous rise of individual motorized transport, the city also recorded an increased share of bicycle traffic in the overall travel. Apart from the general recession impact, the level of development and quality of cycling areas is also responsible for the increased number of bicycle users in the cities.
Appeal for bicycle traffic is increased by systematic expansion of cycling network, upgrade and adaptation of new lanes and connections and the installment of bicycle racks. Unfortunately, this also increases the security risk of bicycle traffic.
Pursuant to the above, this paper will analyze the existing regulatory legislation, current cycling infrastructure, features and characteristics of the problem situation, from the standpoint of the volume of bicycle traffic. The result will be used as a foundation in the process of drafting the program for bicycle transport development in the area of Zagreb.

2 Features of bicycle traffic in the City of Zagreb

Following recommendations and guidelines of the European Commission, which are relating to the future sustainable development of cities and the mobility of their inhabitants, as well as positive examples of European cities and regions, Zagreb is, in the last 10 year, increasingly opting for the development of alternative forms of transport, primarily for the urban public passenger transport and the development of bicycle traffic. Accordingly, for the last 15 years, there are ongoing measures to improve and encourage bicycle traffic in the overall travel, in order to increase its participation and limit motor traffic, prevent environmental pollution and to promote generally healthier life for citizens.

Systematic planning of bicycle traffic in the city dates to the mid 80s, when the Master Plan (GUP), in which bicycle traffic corridors were planned. was first adopted. At the beginning, the bicycle traffic and bicycle–oriented surfaces were intended exclusively for recreational and sporting purposes. Jarun is one of the first examples of building biking trails for recreational sporting purposes in the City of Zagreb (bike path around Jarun was arranged before the Univerzijada 1987). From 1995 to 2010, there was a gradual approach towards the future network planning of bicycle lanes and trails, by renewing the existing and building the new ones, as well as equipping certain zones and locations with bicycle racks. During this period, approximately 220 km of cycling trails were renewed and built. Plotting bicycle paths / lanes began on the city's main roads, whose cross section was sufficient for the interpolation of bicycle paths and for which there was no need to accede major construction projects.

In order to adapt the existing transport infrastructure to the needs of the safe flow of bicycle traffic, regulation of bicycle areas also entailed the creation of specific design solutions of the reconstruction. In the previous period, City of Zagreb undertook a number of other traffic technical and regulatory interventions with the aim to improve conditions for bicycle traffic such as:

- removal of urban and architectural barriers (suspended curbs and construction of suspended ramps),
- adaptation – addition of signaling equipment on the intersections controlled with traffic lights (the introduction of LED lanterns for cyclists)
- marking of cycling areas with red filled (infill) lanes in the full profile, made of thermoplastics, in the areas of high traffic density,
- installation of fixed / flexible protective pillars and staples for the protection of bicycle paths,
- construction of bicycle path or lane during reconstruction and major road repairs.

Figure 1 Setting of traffic signs and equipment for the regulation of bicycle traffic in the City of Zagreb

2.1 The amount of bicycle traffic

First official data regarding the volume of bicycle traffic was recorded and released in a traffic study of City of Zagreb [9], prepared by the famous English design and engineering consultancy firm MVA in the year 1999. The research covered in this study shows that only 0.7% of the daily journeys are realized by bicycle. In this study, bicycle is classified as an underutilized mean of transport. However, it is interesting to note that 51% of households said that they have at least one bicycle, which represents a respectable potential for greater use of bicycles as a mean of travel.
Before the above mentioned traffic study, there was no comprehensive study of the transport demands or traffic volume measurements which could, by using the same pattern, be used as a basis for conclusions regarding changes in the participation in the actual daily journeys. There were, however, several measurements and surveys performed on a limited number of locations and selected population, which provided an approximate image for certain characteristic of the intensity of bicycle traffic.
In the study performed by the collaborating company ISIP-MG [1], a measurement of traffic at 16 locations was carried out, mostly on the city's busiest traffic corridors. This data is presented in the following graph (Figure 2). Based upon these limited measurements, it can be assessed that there is a certain amount of increase in bicycle traffic. This can be attributed to the major traffic infrastructure adaptations regarding bicycle traffic.

2.2 Cycling infrastructure

Most cycling routes (90%) are arranged as bicycle lanes on the pavements of urban roads, separated from the pedestrian walkway with color or in small part with the shallow curbs. Exceptionally, in the central part of the city, on one of the main longitudinal roads, a bicycle lane is established in the roadway profile of the road, in the length of approximately 1300 m. Separate bike paths are arranged only within the sporting and recreational complexes. The prevailing solution of bicycle routes on sidewalks was not met with enthusiasm from the cycling population. This is due to the fact that this solution exposes them to conflicts with pedestrians. Consequently, these solutions should be used only in the corridors of roads with the low intensity of pedestrian traffic. Parallel with the regulation of bicycle paths and lanes, and with the enhancement of bicycle traffic intensity, there was a need for additional cycling infrastructure in terms of bike rack and standpoints.
In recent years, there was a particularly intensive planning and equipping of bicycle parking lots. Initially, the zones within public institutions have been equipped with bicycle holders in the central part of the city. This encompassed approximately 50 locations. On the initiative of the owners and users of commercial services, a large number of sites was equipped with racks. One of the most problematic features in the network of bicycle paths in Zagreb is its lack of interconnectedness into the compact network.

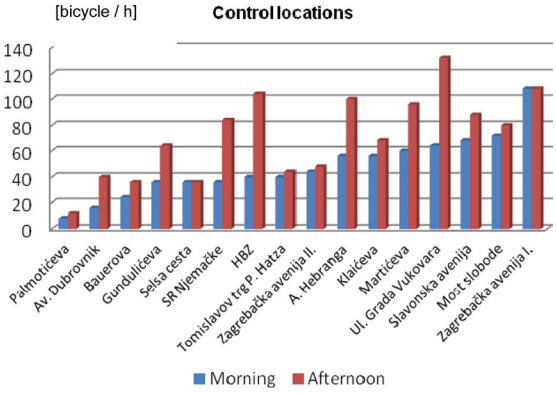

Figure 2 Hourly amount of bicycle traffic on the control locations

3 Development and improvement of bicycle traffic in the City of Zagreb

Development and improvement of bicycle traffic in the city of Zagreb will be focused upon interventions that can be defined through the following program components:
· improving conditions in the existing bicycle network,
· further development and expansion of bicycle paths or lanes,
· implementation of the public bicycle service,
· amending legislation regarding regulation of bicycle traffic.

3.1 Program to improve conditions on the existing bicycle network

Within this program, it is necessary to establish conditions for the smooth flow of bicycle traffic on the existing cycling routes. This includes completion and restoration of traffic signals, connecting bike trails when there is an interruption in their continuity, lowering of the curbs in intersections and installation of signaling equipment on intersections adapted to the needs of bicycle traffic.
As a part of this program, it is necessary to remove all flaws and inconsistencies which are not compatible with the reality of the traffic situation on the field. First of all, this refers to the positioning of the bicycle lane within the road profile, the width of the lane, crossing the lane or path through the intersection etc.
Figure 3. shows examples of typical problem situations, such as: unfavorable positioning of utility infrastructure within the corridor of bicycle lanes, ignoring the need for lowering the curbs when building roads, unadjusted guidance of bicycle lanes through the intersection and more.

Figure 3 Deficiencies and inconsistencies in the existing bike paths and lanes which should be removed

3.2 Expansion of bicycle lanes or paths

In the foreseeable planning period, of 15–20 years, it would be realistic to try to complete the network of bicycle routes planned by the city General master plan, which relates primarily to the regulation of bicycle routes within the corridors of the city's main roads.
Assuming equal development of future network, this would mean expanding the network of bicycle lanes for 5–7 km per year.
In this period, there will certainly be a need for regulation of bicycle lanes and paths on the road corridors of minor importance as these are, seen from the perspective of local areas, urban settlements or districts, recognized as potentially attractive cycling routes. These are the routes of the roads that connect building blocks with public amenities; schools, sport and recreational centers, etc.
In the further expansion of the cycling network in the City of Zagreb, priority certainly belongs to directions and sections of the city center, which are not properly connected and in the areas where the integrity and continuity of a given direction is not ensured.
Within this central part of the network, the most important are the parts of the lanes by which the bicycle stops of the bicycle service would be connected, as that is a prerequisite to the future establishment of the mentioned service.
Expansion of the biking network from the city center to the periphery, should be implemented as a part of the reconstruction and increased maintenance of the roads. During these activities, it is possible to intervene in the construction works and thus ensure the necessary profile for the bicycle path, by reallocating or correcting parts of the profile or by expanding the corridor outside of the existing regular line.

3.3 Implementation of the public bicycle service

For a number of years, city's program documents indicate the need to establish public bicycle service. Relating to this topic, city offices started certain preparatory activities directed towards gathering various experiences in launching and operating public bicycle service.
A convenient and illustrative study was made, documenting certain European and other international experiences regarding launch and implementation of public bicycle service.
Visits and talks about specific experiences of Vienna and Ljubljana were carried out, and this indicated that the most successful public bicycle service is the one established and operated on the principle of public–private partnerships, or based upon granting concessions to companies whose core activity is related to the media, propaganda and marketing activities. Cities normally give such companies the right to use 'for free' attractive advertising space for a number of years (20 years and over). In return, media company equips and maintains functionality of the city's public bicycle service within the concession period.
It refers mainly to the technical, technological and IT–wise high level of supply and reliability in the operation, which faces a positive response and approval from the citizens. In addition, cities that have modern and reliable public bicycle service are provided with the image of cities with high awareness of environmental and energy efficiency.
The basic role and importance of such a modern bicycle service relates to the promotion of a new life attitude towards the environment and the impact on behavioral change in citizens regarding the selection of means by which they travel.

3.4 Amending legislation regarding regulation of bicycle traffic

Since the traffic police reports have not registered alarming statistical indicators regarding road accidents and casualties of cyclists in the current low intensity bicycle traffic, it was considered that there is no need or justification for changes in this field. Consequently, the 'Law on Road Traffic Safety', which was so far amended on couple of occasions, mainly remained

unchanged in this section. However, the current regulations governing the area of bicycle traffic are not adequately adapted to the situations of intense bicycle transport in neither urban areas nor in general.
To ensure proper conditions for future expected growth of bicycle traffic, it will be required to intervene in the area of its control. The mentioned normative interventions must be made in the areas of planning and designing of cycling infrastructure, as well as in the planning of bicycle traffic and amendments to the regulations regarding the safety of bicycle traffic.
In the area of planning and designing the bicycle infrastructure, there is a lack of quality project instructions and guidelines for designing bicycle paths or lanes, mostly in the part that defines the position of a given bicycle path or lane within the road profile. There is no regulation or recommendation on guiding the bicycle paths through an intersection, and no regulation regarding the width of the lane with regards to the intensity of bicycle traffic. Furthermore, regulation is non–existent in regard to the designing traffic light plans or the amendment of the traffic signaling equipment needed for bicycle traffic.
There is a need to intervene in the traffic regulation relating to the bicycle traffic safety, mostly in regard to the 'Law on Road Traffic Safety' and relevant by–laws that accompany it. Mentioned interventions are necessary regarding areas relating to the prevention of potential security risks in terms of prescribing rules of behavior, speed limits, rules on giving priority, and in the following security risk situations and relationships among participants:

- relationship between cyclists and pedestrians, on the sidewalk where the established bike paths are located,
- relationship between cyclists and drivers of motor vehicles, on the road surface where the bicycle lanes are established,
- the relationship of cyclists / pedestrians and cyclists / driver of the vehicle, in crossing over traffic light controlled and uncontrolled intersections,
- movement of cyclists in the pedestrian zone,
- movement of cyclists at night and in poor visibility,
- equipment and functionality of bicycle,
- driving skills and knowledge of traffic regulations.

Future increase in the use of bicycle, as a mean of transport for daily travel, needs to be properly addressed when designing residential and other buildings.
It is the fact that the existing residential buildings generally do not have enough common usable space for keeping bicycles. Consequently, in regard to their future design, it should be obligatory that apartment buildings provide adequate space to hold at least one bicycle per flat unit up to 50 m2, and relatively larger space for larger flats.

4 Conclusion

In the context of achieving the preconditions for sustainable development of transport in the City of Zagreb, it is necessary to encourage the promotion of various forms of transportation that are alternatives to individual motorized traffic.
One of these alternative forms of transport is cycling. Its development must be intensified by continuous adaptation and regulation of transport infrastructure, by upgrading the cycling network, by linking existing bike corridors, realizing the project of public bicycle service and by conducting preventive activities.
All of the above mentioned measures, aimed at improving bicycle traffic, should provide conditions in which the bicycle traffic becomes a respectable form of daily travel. Consequently, its share in the total number of realized trips should be increased to form at least 5 percent of the total number of realized trips.

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