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# THE POSSIBILITY OF SOLVING CYCLING TRANSPORT IN CENTRAL URBAN AREAS

**Summary.** The rapid urban development in recent years has been reflected not only by the change in structure and size of towns, but especially by the increase in population mobility, which is strongly reflected by the fact that urban centers are clogged with individual transport, therefore, experts are dealing with possibilities of alternative solutions. Especially bicycle transport for its significant reach, readiness to ride, easy operation and relatively high cruising speed has the appropriate conditions for further successful development. In our contribution we would like to outline some problems with the equality issues of bikes in the street area.

# MOŻLIWOŚCI ROZWIĄZYWANIA PROBLEMÓW TRANSPORTU W CENTRACH MIAST PRZY WYKORZYSTANIU TRANSPORTU ROWEROWEGO

**Streszczenie.** Dynamiczny rozwój miast w ostatnich latach znajduje odzwierciedlenie nie tylko w zmianach ich wielkości i infrastruktury przestrzennej, ale przede wszystkim we wzroście mobilności społeczeństwa, co wiąże się ze zwiększonym popytem na przejazdy. Stopniowa stabilizacja przestrzeni miejskiej oraz liczby mieszkańców generują odpowiednie warunki do zastosowań nowych sposobów przemieszczania się ludzi w miastach, alternatywnych dla transportu drogowego (silnikowego). Szczególnie transport rowerowy – z takimi walorami, jak znaczący zasięg i stosunkowo duża prędkość jazdy – znajduje odpowiednie warunki do dalszego efektywnego rozwoju. W artykule przedstawiono niektóre problemy związane z ruchem rowerowym na ulicach miasta.

## 1. INTRODUCTION

By creating negative externalities, road transport is among the biggest violators of sustainable development. We can define externalities as a source of market failures that occur when economic bodies transfer costs or benefits to other bodies outside the market mechanism.

Significant externalities are: accidents caused by operation of transportation systems (loss of life, medical care for the disabled and so on), congestions and the others (air pollution, emissions toxic for health, environment and buildings, climate change, emissions of greenhouse gas ($CO_2$), which have a lasting impact on the earth's climate, noise). The greatest proportion of negative externalities of transport is attributed to accidents. Entering the traffic operation, every participant risks injury or

death. The amount of this risk is, of course, different and varies in space and time. Taking into account the speed of vehicles and state of infrastructure, traffic accidents are becoming a serious problem. Traffic congestions cause huge losses in terms of loss-making time and environmental impact and reduce the availability of the territory. This can be alleviated by increasing car occupancy and use alternative ways of transportation. Nowadays it is estimated that about 10% of the road network suffers from congestions [3].

Prognosis for the next 10 years is alarming. As long as the European community will not solve congestions, in 2010 they will increase and reach 80 billion per year, which will form 1% of EU GDP.

70% of the world's population is expected to live in cities in 2040 (compared to 30% in 1970). It is therefore necessary to create the environment of cities so that the life in them is "pleasant" [3].

In comparison with motor traffic, cycling as means of transport has many advantages. In particular, the negative externalities (emissions, noise, vibration) are not created, it prevents congestions and the like. It also has positive impact on health, acting as prevention against diseases that are caused by lack of exercise. Bicycle transport can be defined as an active way of transport, which is environment friendly, promotes a healthy lifestyle and has a positive effect on health.

## 2. DEVELOPMENT OF CYCLING TRANSPORT ABROAD AND IN SLOVAKIA

There is no universal tool for promoting cycling as coequal means of transport because each city has its specific geographical structure, history, policy and so forth.

These aspects are derived from both the total level of economy and rate of economic growth and the method and direction of life quality development. But we can say that the most common economic tool to promote cycling are subsidies which are among the most effective tools to promote cycling transport. In most developed European cities, bicycle transport is one of the most important topics and every political party that wants to succeed in municipal elections will give the priority to improve the organization of bicycle transport as such. In developed cities, with a quality network of cycling routes, the bicyclist share ranges from 5 to 35% [3].

As an example we can allege Sweden and Netherlanden, that supported good cycling facilities and an extensive network of cycling routes. Scandinavian countries are generally known for their approach to bicycle transport. Bicycles in Stockholm are equivalent kind of transport and are on equal footing with cars and public transport. Each kind of transport has its own lane (see Fig.1).

In the 1970s Dutch cities were in a similar situation to the one of present-day Slovak cities – increased demands of individual road transport were solved by higher-capacity roads. In the second half of the 1980s, however, the nation-wide change in opinions of traffic problem solutions occurred in the Netherlands.

The "new" approach may be expressed by the following equation: integrated approach, cooperation between traffic engineering and urban planning and equality of all transport modes. This leads to the creation of attractive urban centers, increase in safety, creating places for people. The result of this trend has been building of the first so-called woonerf (traffic tranquilized zones in residential areas) and winkelerf (traffic tranquilized zones in commercial areas) since 1977 [5].

In our latitudes, i.e. Czech and Slovak Republics, Poland, Hungary during the 20th century, the technical and transport quality of infrastructure (except for some regional differences), essentially moved in the same direction. Non-motorized transport has been only a marginal issue, far beyond the car and public transport. In practice it means that there are hardly any tranquilizing measures adopted for cyclists. In the common space with other traffic, cyclists are not taken into consideration, though according to the law they are (or should be) the coequal users of road transport, which causes that they are forced out to the so-called greens reserves and green spaces or they are forced to weave their way through build-up areas of tranquilized streets.


Fig. 1. The choice of vehicle in Stockholm
Rys. 1. Segregacja ruchu (wydzielony pas dla rowerów) – przykład Sztokholmu

These and other similar measures, and, in essence the incomprehension of the role of daily bicycle transport, cause that the cyclist is in a position of the occasional user and is forced to use a safer and faster means of transport, which is the individual and public transport. All the former Eastern bloc countries, as well as countries with strong lobbying motor traffic policy, such as the United States, were condemned to this view of cycling transport. Austria and its metropolis Vienna have experienced similar development in the past, where facilities for cyclists already existed in the 1960s, but were massively canceled at the time of the automobile boom. In the last 20th years Vienna has tended to equalize the bicycle transport as it is in the neighbouring western countries.

## 3. CHARAKTERISTIC OF BICYCLE TRANSPORT

Cycling is a suitable mode of transport for urban environment. City must provide a comfortable and secure infrastructure for cyclists [1]. An erroneous argument is that there is no need to build cycling infrastructure, because just a small part of city inhabitants ride a bike. But the opposite is true. It is because of lack of infrastructure and the danger from the cars that is why only a fraction of the population use bicycles in the cities.

Bicycle is an efficient means of transport. In operation it does not produce any emissions and it is obvious that, when taking into account also external costs, it has less impact on the environment than a car. Another benefit is easy and convenient way of integration of physical activity and urban life.

An important argument is the fact that a bicycle covers an area of about $1m^2$ which is about 8% of the area which is needed by a car. Certain claims might arise when designing new cycling routes especially in densely built-up centers. But it can be avoided by a sensitive integration of bicycle transport into the existing transport system. Bicycle is a quick means of transport especially in urban areas. Low requirements for parking minimize the distance from the parking place to the destination. Bicycle cruising speed is between 15 and 25 $km.h^{-1}$, which is often more than the speed of a car in rush hours.

Among the basic criteria of development quality of different modes of transport is its security. The most vulnerable are so-called unprotected categories of traffic participants - pedestrians and cyclists. The requirements for road transport safety and the principles of a comprehensive solutions of road network demand that vehicles with different traffic characteristics (particularly speed) are conducted jointly or separately, but with the condition of mutual respect and acceptance of operational requirements, especially of the weaker road users. Differences in the nature of the movement of cyclists require sufficient longitudinal but mostly side distance from the parallel or upstream traffic.

The oddness of bicycle transport is a sudden change in speed and direction of motion, which usually is a cause of serious conflicts with severe consequences [4].

## 4. GENERAL PRINCIPLES OF PLANNING THE BICYCLE TRANSPORT

The bicycle transport can achieve remarkably high proportion of the division transport labor and it can help solve the mobility in cities and townships. The fundamental prerequisite is the offer of quality infrastructure that allows full-area transport infrastructure. The purpose of the design of cycling routes is to offer a safe, comfortable and, if possible, the direct transport link inside and outside the built-up areas. This requires a network of roads for cyclists, linking all major sources and destinations of cycling transport. Routing the road for cyclists must be solved in terms of the highest possible safety, high attractiveness and the shortest possible route. the common conduction of pedestrians and cyclist is very often seen as a solution of some problems (as can be seen on Fig. 2 from the city of Grenoble, France).

Fig. 2. The common path for cyclists and pedestrians – Grenoble
Rys. 2. Grenoble – ciąg pieszo-rowerowy

Designing bicycle communications should be based on certain criteria, which are as follows: [1, 3, 4]

- ✓ safety of building of bicycle communication
- ✓ attractive destinations and sources - the network of bicycle roads should be linked to all relevant residential areas and districts, industrial districts, school campuses, but also concentrated objects of facility and leisure time centres,
- ✓ directness - the choice of direct routes is a priority in the development of bicycle transport,
- ✓ road surface must be chosen appropriately, because the bicycles are easily damageable,
- ✓ gradient should be minimal,
- ✓ clarity of road signs,
- ✓ the quality of the environment - such a route must be chosen (if possible), where the smallest amount of harmful air pollutants is,
- ✓ attractiveness is the main criterion for cycling routes,
- ✓ link to the Land Use Plan, where the suggestion of bicycle road should be based on city development plans outlook.

Currently, basic coverage of area on a bicycle, as well as the link between communities within the daily trips to work, schools, shops, etc. is becoming more and more interesting. Then a safe route for cyclists is the one that uses not only the bike lanes but also the land road. The bicycle routes in built-up areas can be divided into: [1, 5]

- ✓ Main routes. They serve as direct connection of important sources and destinations, running through several neighborhoods, or municipalities, respectively, and are designed primarily on the principle of separation (ie. trails or lanes for cyclists). In particular, they constitute the capacity flowline and shall enable a smooth ride. The route is led without detours with a preference of bicycle transport on crossroads of lower road categories and with the possibility of overtaking.
- ✓ Link and collection routes. Combine the main routes to each other and simultaneously perform the function of collecting of small-area transport operation. These routes may be kept both as separate facilities or as mixed traffic with motor vehicles or pedestrians.
- ✓ Whole-area transport handling. Whole-area transport makes use of the existing service roads or roads with low traffic volume, respectively. Approximate mutual distance of the main routes in built-up areas is from 500 to 1000 meters, for the densification of the network by means of link and collection routes, the distance of 200 to 500 m is being considered.

## 5. BICYCLE TRANSPORT IN ŽILINA

In spite of the fact that Žilina has good predispositions for everyday use of bicycle transport, the offer of built bicycle roads is small. There is no network of bicycle roads and those that are already built are only a small part of the functioning system of bicycle routes in the city [6].

Currently there is a proposal of bicycle communications network, which builds on the previous Land Use Plan and integrates already existing sections of road bicycle communications in the system. It is based on radial-round communication system of the city, with a link to the recreational background of the city and the superordinate network of bicycle roads passing through town (cycle-artery). As with roads for motorized traffic, we also must allow the connection of bicycle roads to the network of bicycle roads of supra-regional importance that goes through the city.

The draft concept of urban bicycle communications supposes routing of the main urban cycling routes as radial, which links residential areas built along the perimeter of the city with city center. All of the main urban bicycle communications enter the center and there in the pedestrian zone where the principle of priorities is changing, cyclists adapt regime to pedestrian zone so that after having crossed the pedestrian zone, they can continue on roads which are reserved only for them.

Finally, it should be noted that the implementation of bicycle roads in the city, whose communication system has been created for dozens, even hundreds of years, necessarily causes conflicts between those who are stabilized in a profile of today's street (pedestrians, but especially motorists) and those who also require their area - cyclists. Streets in built-up areas of the city cannot be widened without the necessity of tearing down the houses that borders the streets and therefore it must be recognized that the construction of bicycle roads is a process, in which new communications are incorporated to the street profile at the expense of pedestrians and drivers. But on the other hand, what is going on is just equality of individual modes of transport.

In spite of what has been mentioned above, it is necessary but natural to build cycling roads in cities, because the more cyclists move around the city, the fewer cars there will be on the roads.

## 6. CONCLUSION

In practice we often meet with the view that bicycle transport is more a sport, tourism or green transport. Few people understand it as an alternative and a choice. Many of us must use their cars on one day, but on the following day we prefer using bicycle or public transport. The aim should not be that tomorrow we all leave our cars at home and ride our bicycles. This requirement is absurd and

it would bring more harm than good to the bicycle transport. The objective should be somewhat different - in creating such conditions that each of us can have the possibility to go to work, offices, doctors, school not only by car, but also by bicycle - that is to say to have real freedom of choice of means of transport.

Priority of development of bicycle transport lies not only in high quality infrastructure offer, but it is also necessary that it enables the traffic operation on whole areas [1].

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**References**

1. Kalašová A., Surovec P.: *Upokojená doprava*. 1. Vyd. Žilina : Žilinská univerzita v Žiline v EDIS – vydavateľstve ŽU, 2008.
2. Syrový K.: *Jízní kolo jako rovnoprávný dopravní prostředek* In: Dopravná infraštruktúra v mestách, 6 International Conference, 22 - 23.10.2008, Žilina, Slovakia conference proceedings.
3. *EUROPEAN UNION Cycling: the way ahead for towns and cities*, http://ec.europa.eu/ environment/ archives/ cycling/cycling_en.pdf
4. Petráš M.: *Proč kolo patří do města*, http://www.nadacepartnerstvi.cz/doprava/cyklistika
5. Pokorný P.: *Rozvoj cyklistiky ve městech - je možné se v českých podmínkách inspirovat Holandskem?*, In Internet [online] 1.10. 2006, [8.4.2010] available at: http://www.cdv.cz/rozvoj-cyklistiky-ve-mestech-je-mozne-se-v-ceskych-podminkach-inspirovat-holandskem/
6. Žarnay M.: *Budovanie cyklistickej infraštruktúry...*, http://www.mulica.sk/index.php?option=com_content&task=view&id=109&Itemid=1

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