

Opole – A Cyclist-Friendly City

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The main objective of the paper is to present the way to modernize the network of cycling paths so that cycling is more pleasant, safer and more convenient [15]. We want to change the means of transport from the car or bus onto your bike.

Keywords: bicycle paths, traffic engineering, personal city transportation.

1. INTRODUCTION

Opole, the capital of the Opole province, a city on the Oder river, with population of about 120,000 people. 12 thousand new cars are registered here every year. The city is growing at a surprisingly fast pace, and society, economy and communication are subject to high-impact changes. There are new trends emerging here, one of which is a bicycle. More and more Opole citizens ride a bicycle to work, school or to visit their friends. The number of city bikes users grew by as much as 30 percent in 2014. Busy streets, traffic jams at intersections, lack of parking spaces encourage people to leave their cars in the garage and dust off their two wheels. Also, shorter time needed to get to a destination positively affects the popularity of bicycles. In many cases it turns out that we can get to our destination faster with a single-track vehicle than by car or bus. However, the adequate road infrastructure is a prerequisite for a pleasant and safe journey. There are 35 marked bicycle paths or pedestrian and bicycle routes, 8 sections of one-way or closed streets on which bicycle traffic is allowed and two roadsides adapted to bicycle traffic in Opole. All in all, there are about forty-five routes with a total length of 22 km where cyclists can feel safe. It is definitely not enough for a city with the area of 96.55 km².

2. STATISTICS

2.1. SURVEY

In May 2015, the students of the Faculty of Civil Engineering at Opole University of Technology conducted a survey among 100 Opole citizens. The first question of the survey was the following: by what means of transport they move around their city most frequently. There were four choices: MZK bus, on foot, by bike or by car.

What means of transport is most commonly used in Opole?

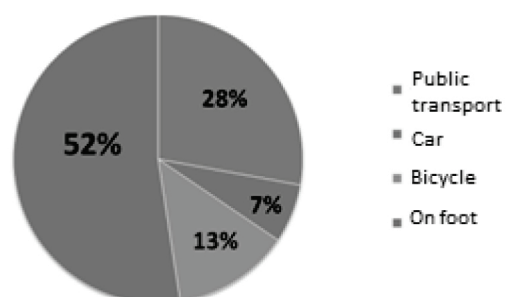


Fig. 1. How do you usually move around your city? [5].

The majority of respondents, as many as more than a half of them go on foot; every third person uses public transport – MZK buses. Only 13 percent of them consider a bicycle as the best means of transportation around Opole, and about 6 percent less select the car.

If there were more bike paths in Opole, and if the use of bike was more convenient, would you consider using a bike?

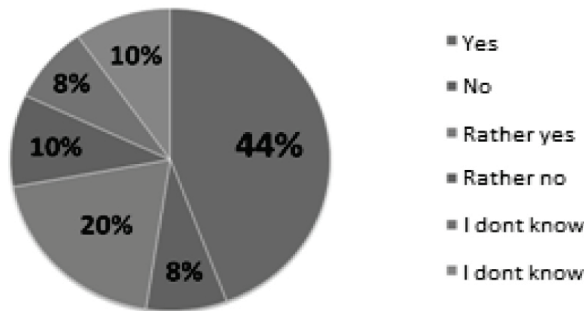


Fig. 2. If there were more bike paths in Opole, and if getting around on two wheels was a safer, more convenient and more enjoyable would you be willing to change your means of transport to the bike? [5].

Opole citizens were also asked whether in a situation where there were more bicycle routes in Opole, getting around on two wheels was safer, more comfortable and more enjoyable for them - would they be willing to change their means of transport to a bicycle. Respondents could choose from six answers: yes, no, rather yes, rather not, I do not know, I already ride a bicycle.

As much as 44 percent of those surveyed definitely would change a car or bus to a bicycle. One-fifth of them would also have left the car in the garage and ride a bicycle, but only when the cycling infrastructure for them became more welcoming. In such a situation, 8 percent would not know what to choose, and 10 percent already ride a bicycle. The remainder of the respondents did not want to change their current means of transport.

2.2. NEXTBIKE OPOLE

NEXTBIKE city bike rental system was launched in Opole on 15th June 2012. Currently, it consists of 160 bicycles at 16 stations. Statistically, every Opole citizen took a city bicycle ride at least once. A bicycle is rented every six and a half minutes. There were 58,676 rentals in the season of 2014.

3. ROUTE: UNIVERSITY – OLESKA – UNIVERSITY OF TECHNOLOGY – SOSNKOWSKIEGO

It is the route most often taken by cyclists on city bicycles. There are two choices for getting from the University to the University of Technology. Unfortunately, no matter which one is chosen, it is not possible to use a bicycle path all

the way. The bicycle lane is designated for cyclists only in half of the route, while the other half is an old rough pavement with high curbs. There are no bicycle crossings, and safety should be a priority. When a cyclist appears on a sidewalk, an uncomfortable situation arises for both a pedestrian and a rider. Just a moment of inattention can lead to a tragedy. It is essential that the bicycle lane is built in the whole section with so much pedestrian and bicycle traffic. A shorter section, often used by cyclists, has been used for analysis. Setting off from the University of Technology campus and heading in the direction of the University of Opole, there is one pedestrian crossing with a bicycle crossing and four pedestrian crossings without it. Bicycle crossing is located on the intersection of General Kazimierz Sosnkowski and Chabrów streets. Pedestrian crossings are located at the intersections:

- Stokrotek – General Kazimierz Sosnkowski
- Oleska – Wodociągowa
- Oleska – Macieja Rataja
- Oleska – Bohaterów Monte Cassino [2,3].

All pedestrian crossings should be changed and bicycle crossings should be separated for the continuity of the bicycle path and to improve the safety on roads. It is necessary to ensure adequate safety for pedestrians, cyclists and other road users. The cyclists should roll their bikes alongside within the pedestrian crossing. Unfortunately, in practice, the majority of cyclists do not adhere to road traffic regulations when passing through the crossing. They put themselves and other road users at risk by arriving to the crossing at a high speed. In such a situation, a driver often has only a few seconds to make a decision and react. Just a moment of inattention can lead to a tragedy. Police statistics show that most accidents involving pedestrians and cyclists happened just at pedestrian crossings. Unfortunately, every third such accident is a fatal one. In order to build bicycle crossings at the above-mentioned intersections that would protect against accidents, it is necessary to apply various safety principles including:

- Vertical sign at a pedestrian and bicycle crossing is D-6b "pedestrian crossing and bicycle crossing" (fig. 3)
- The area designated for the bicycle crossing must be marked with two dashed lines transverse to the road axis.

- Bicycle crossing marked as the extension of the bicycle road, perpendicular to the axis of the road.
- The distance between pedestrian and bicycle crossings should be at least 0.5 m.
- Bicycle crossing pavement should be in red (fig. 4)
- In pedestrian-bicycle roads, the designated pedestrian crossing should be at least 4 m wide, and the bicycle crossing should be at least 2 m wide.
- The height of curbs on crossings for cyclists should be reduced to the grade line of the carriageway edge. The difference between the bicycle road grade line and that of the roadway should be zero. Do not use the curbs at the intersection of the bicycle road with the roadway and public exits, maintaining the continuity of the surface structure of the bicycle and regular road.
- It is unacceptable to set up hedges higher than 0.6m, advertisements and fences between the road and the bicycle road in the areas of intersections.



Fig. 3. The D-Mark-6b”crosswalk and the passage for cyclists” [11].



Fig. 4. Crosswalk of transit for bikers with the ground red [4].

A major problem is a crowded footpath next to Eastern Opole (fig. 5). At its narrowest point it is less than 3 m, which in practice is sufficient only for pedestrian traffic.



Fig. 5. Opole East Train Station [Photo taken by authors].

There is a junction of Oleska – Bohaterów Monte Cassino streets with traffic lights near the narrow passage. The crossing is one of the busiest in the city during peak hours. Cyclists and pedestrians arrive almost simultaneously from the nearby junction to this bottleneck. High flow at the intersection translates into a throng at the crossing next to the train station, which leads to a situation in which cyclists on the sidewalk fail to yield the right of way to pedestrians. In the future, a park&ride spot is to be built nearby. Citizens of Opole will be able to leave their cars in the parking lot and continue their journey on two wheels. This will lead to a situation where the traffic at the narrow passage will become even more challenging.

The narrow passage is also the entrance and exit to and from the Opole East train station (fig.6.). While the entrance is easy, the exit poses a high risk. Anyone wishing to get out of the building is not able to see anything through the concrete walls. There is a high probability that when exiting the station, they can be hit by an oncoming bicycle. The exit from the building should be secured to avoid such situations. The preferred solution is to lay the pedestrian walkway inside the building, and lay the bike path on the existing pavement. Walled arches are visible on the walls inside the station. There were huge windows there at the beginning of the nineteenth century. In the place where windows were originally designed, the entrance and exit were built on opposite sides of the building. (fig. 7.). Barriers should be built at the entrance and exit to prevent entry by cyclists. The implementation of such a walkway requires an assessment of the technical condition of

foundations and of the substrate parameters. Detailed survey would enable to make a decision regarding the need to strengthen the foundations in the area of the walkway. Crossing through the station would allow the building that has been already forgotten by everybody to regain its past splendour.



Fig. 6. Opole Station East [Photo taken by authors].



Fig. 7. Opole Station East – bricked up window [Photo taken by authors].

4. THE LINK BETWEEN OPOLE WEST STATION AND THE CITY CENTER



Fig. 8. The concept of connection Opole Station West with the city centre (authors elaboration by [10]).

Opole West station is separated from the centre by the Odra river [7]. There are only few possibilities to get from one side of the river to the other. It takes a lot of patience to get from Opole West to the city centre. Anyone who goes down the Sychalski street can be almost sure to encounter trouble, including the largest traffic jams in the city. If you swap a car for a bicycle in the afternoon, the en-route time will be definitely much shorter. Despite the fact that you will arrive faster, it will certainly not be easy and pleasant. When the bicycle path ends, the cyclist is forced to navigate through a busy road or a crowded sidewalk. Faced with the lack of other options, the person riding a bicycle must cross every crossing on foot. There are also a few stairs to walk, and the biggest challenge is to sidestep the walkers. You need a great shrewdness and agility to make the journey smooth even to a small degree.

The construction of a bicycle path it is not an easy task in such difficult urban conditions. The reconstruction of Stanisław Sychalski street is scheduled for the time of closing of the bridge on the Niemodlińska street in order to create an additional lane for buses and emergency vehicles. Another proposal is to build a bicycle path instead of the bus lane. When the speed limit is up to 50km/h, there is no obligation to separate the bicycle path and the road [9]. Such a solution is the fastest connection between the Opole suburb community and the city centre.

Another alternative connection between Zaodrze and the centre is a detour of the busiest streets. This route is about a half longer, but allows for safe and comfortable reaching the destination.

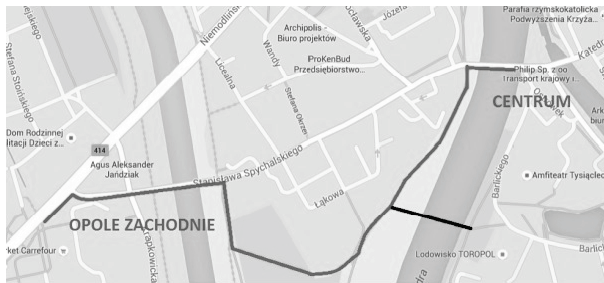


Fig. 9. Alternative concept of connection Opole Station West with city centre (authors elaboration by [10]).

There is already a section of the bicycle path along Stanisław Spychalski street. The existing pedestrian path should be adapted on the remaining part of the route and expanded by a bicycle path. The minimum width of this route should not be less than 2.5 meters, so that the pedestrian and bicycle traffic can be free in both directions. In addition, the route should be designed so that its slope does not exceed 10 percent along 250 meters. The section of the route along the river will be located at the crown of the flood embankment, otherwise water flooding could temporarily disable the route. It is also important to signpost the bicycle path with vertical signs. Great interest in the bicycle path can be observed at the site of the planned route today. You can also meet families walking along the Oder river, and cyclists making their way on a narrow sidewalk are a big problem for them. A possibility of reaching the other side of the river would be a great convenience for both cyclists and pedestrians. A bridge made available for bicyclers and pedestrians only would complement the planned bicycle path. Such a bridge would have a length of about 150 meters and a width of at least 2.5 meters. Bridge abutments would be located on the flood embankments. This would allow an easy entry for cyclists and significantly reduce the cost of construction.

It would be a backstay structure, also known as a suspended structure. The bridge would consist of one span suspended on one pylon. The pylon would be located on the west bank. The construction of a similar structure began in Przemyśl in May 2015 (fig.10.). The crossing will connect two promenades there. The bridge in Opole would be modelled on the facility on the San river. The construction time of such a bridge is about half a year, and the cost of building such a facility has been almost entirely funded by the European Union in Przemyśl.



Fig. 10. The visualization of footbridge over the river San in Przemyśl [6].

5. ADDITIONAL SUGGESTIONS

Bicycle rental facilities are an important element included in the road infrastructure. An example is the system of self-service stations that allow renting a bike, due to their simplicity and number. These stations are equipped with terminals which enable people to easily rent a bicycle (fig. 11). Using a bicycle, you can get to the workplace quicker and easier navigate the busy city centre. The bike takes up much less space on the road so it does not affect the traffic jams.



Fig. 11. Example, the bike station [1].

Biking saves time and money and improves well-being. If people prefer to swap a car for a bicycle, it would provide less congestion, noise, and pollution in the city. Therefore, you should pay attention to the aspect of adequately promoting this type of activity. A reward system in the form of tickets to the theatre and cinema, as well as discounts in the shops can become a part of the promotion. This solution has already been employed in Sopot, where one could top up the account using the MasterPass card in the amount of 10 PLN to receive a bonus of 20 PLN.

The system of supports is another interesting facilitating solution for cyclists. They are located near intersections with traffic lights. They enable the cyclists waiting for the green light to comfortably rest an arm or leg so that there is no need to dismount the bicycle. These supports are

made of a single frame (for a leg) or a double one (for a leg and arm). The lower frame includes anti-slip holes. Each of them is two meters long. Two cyclists can use it easily. Supports are mounted at a distance to ensure safety for pedestrians and cyclists (20cm from the bicycle path and 50cm from the road). The cost of installation of 15 supports for cyclists is 12 thousand PLN. The cost of fitting 15 stands for cyclists is 12 thousand PLN. An example of where such a system has been introduced and successfully is Kraków.



Fig. 12. Example stands for applied at the crossroads [8].

But world example show that people all over the world try to solve problems connected with safety of cyclists and people who have contact with them. For example in the Netherlands Dan Rosenberg invented special bike road (fig. 13). The road shines in the dark to show the cyclist guide line.



Fig. 13. Led special bike roads by Dan Rosenbeg [13].

On the opposite side in Denmark constructor agency Dissingt Weitling architecture launched the project which includes special bicycle wharf. Cykleslangen, which means bike snake, was built

in 2014 in Copenhagen (fig. 14). It prevents pedestrians and cars from any contact with bikes.



Fig. 14. Cykleslangen [12].

6. CONCLUSIONS

Transportation is an essential part of every city. Comfortable and safe mode to move from one part of a city to another is possible if appropriate conditions are provided and these include providing safe bicycle paths. These consist of flat and level pavements and well-marked crossings of bike paths with roads and pedestrian traffic. Bike paths should be well signposted and their plans should be categorized so that there was no doubt where the starts and ends are.

By analyzing the movement of motor vehicles and the most congested parts of the city during peak hours, we can easily determine where the traffic should be reduced as soon as possible.

The support expressed in the survey and statistics shows that the citizens of Opole are eager to use this kind of solutions. As a result, they would not waste time standing in traffic or searching for a parking space or waiting for the bus, while they have alternative and much healthier means of transport. Thus, they also contribute to reducing the emissions and the number of cars in the city.

It is reasonable to continuously encourage people to use bicycles through campaigns promoting these types of solutions. That is the aim of the system of bonuses, discounts, and promotional coupons in stores, restaurants and other public places. Note that by riding a bicycle, we have the unlimited mobility, which no other means of transport are able to provide.

Providing these fundamental conditions guarantees the success of the project of a municipal cycling infrastructure, creating a bicycle-friendly city. Note, however, that travelling by bike is a seasonal solution, requiring good weather, so the

need to look for alternative ways of reducing traffic in the city still remains.

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