

sustainable mobility; travel demand management; bike trips; bike infrastructure

Katarzyna NOSAL

Cracow University of Technology
24 Warszawska st., 31-155 Cracow, Poland
Corresponding author. E-mail: knosal@pk.edu.pl

TRAVEL DEMAND MANAGEMENT IN THE CONTEXT OF PROMOTING BIKE TRIPS, AN OVERVIEW OF SOLUTIONS IMPLEMENTED IN CRACOW

Summary. Car traffic in cities causes a decrease in travel speed, irregularity of public transport operation and, as a consequence for travellers, significant time losses. Because of congestion the accessibility to the destination points, especially those that are located in the city centre, is threatened. Other difficulties concern: road safety, increasing air pollution, traffic noise and global warming. Construction of new roads and transport facilities requires large financial resources and covers large areas.

City authorities implement many solutions to reduce these negative effects of car transport, including strategies which aim towards change in travel patterns. Inhabitants are encouraged to travel by more sustainable transport modes, including bikes. The concept is called travel demand management and in Poland is still a new approach to the passenger transport.

This paper presents examples of instruments that are most commonly used abroad to encourage bike travels and an overview of the activities carried out to promote bike usage in Cracow. The paper also identifies Best Practices implemented in the area of Cracow and significant deficiencies in the basic issues and actions necessary to be undertaken in the future.

ZARZĄDZANIE POPYTEM TRANSPORTOWYM W KONTEKŚCIE PROMOWANIA PODRÓŻY ROWEROWYCH – PRZEGLĄD ROZWIĄZAŃ REALIZOWANYCH W KRAKOWIE

Streszczenie. Ośrodki miejskie zmagają się z problemem nadmiernego ruchu samochodowego, który prowadzi do występowania zjawiska kongestii komunikacyjnej i towarzyszących mu skutków w postaci spadku prędkości podróży, nieregularności kursowania środków transportu publicznego, strat czasu ponoszonych przez podróżujących oraz obniżonej dostępności obszarów. Negatywne konsekwencje użytkowania samochodów dotyczą także kwestii bezpieczeństwa komunikacyjnego, wzrastającego zanieczyszczenia środowiska czy emisji hałasu. Inwestycje w transport drogowy wymagają dużych nakładów finansowych oraz wiążą się z zajętością obszarów, które mogłyby zostać wykorzystane w bardziej efektywny i przyjazny mieszkańcom miast sposób.

Jedną z obecnie realizowanych koncepcji prowadzących do ograniczenia tych negatywnych zjawisk jest wdrażanie strategii mających na celu zmianę zachowań komunikacyjnych mieszkańców miast w kierunku korzystania z bardziej zrównoważonych form mobilności, w tym z jednośladów. To nowatorskie w Polsce podejście do przewozów pasażerskich zwane jest zarządzaniem popytem transportowym.

W niniejszym artykule zaprezentowano przykłady najczęściej stosowanych za granicą instrumentów zarządzania popytem transportowym, zachęcających do przejazdów rowerem, oraz przeprowadzono przegląd działań realizowanych w ramach promowania jednośladów w Krakowie. Wskazano dobre praktyki i innowacyjne rozwiązania wdrażane na gruncie krakowskim oraz istotne braki w podstawowych kwestiach i działania niezbędne do realizacji w przyszłości.

1. INTRODUCTION

It would seem that there is no need to convince anybody about the advantages of a bicycle. A bicycle is the fastest means of transport in a congested city, with a great potential of meeting transport needs, especially on short and medium distances, up to about 5.5 km.

Cycling is one of the most enjoyable ways to travel, has a beneficial effect on health, fitness and well-being. In addition, a bicycle is relatively inexpensive to purchase and maintain, as opposed to a car, for example. From the point of view of the city authorities, its advantages should also be considered from the perspective of economic efficiency, as this form of transport does not require building large infrastructure facilities, such as overpasses, tunnels or spacious parking lots for motorized vehicles and does not pollute the environment. A bicycle is one of the most sustainable forms of mobility and is a supplement to the public transport in the city, and when backed up with appropriate solutions, particularly infrastructure solutions, it can also become a very serious alternative to individual motorized transport. Hence, as we can see, bike possibilities are enormous, however unfortunately they are still underestimated. Despite the indicated advantages, in the Polish cities the proportion of bicycle users is still small, although in recent years this tendency is slightly increasing. The highest share in bike usage for travelling, meaning 4% is noted in Wrocław [23]. In Gdansk the percentage of bike trips in modal split, in all city travels is 2%, in Warsaw, 1%, and in Cracow, according to the Comprehensive Traffic Research as of 2003, 1%, where for travels in the city centre, 2% [15]. While in comparison, the percentage of bike trips in modal split in selected western European cities is at the following levels: Amsterdam, 22%, Berlin, 13%, Gratz, 14%, Vienna, 6%, Nantes, 5% [23].

Why do our western neighbours' cities have a higher percentage of cyclists? That is due to many reasons, such as climate, topography, cultural conditions, although to a large extent this results from cycling policies conducted by foreign metropolis, connected with promoting bikes and creating such travel conditions that favour a bicycle, making it a more competitive means of transport, than a car.

A pro-bicycle transportation policy is very often associated with the need to reduce negative effects of mobility, especially the ones related to individual motorized transport (including transport congestion, pollution, noise, accidents, etc.). Moreover, a possible solution to these problems has been increasingly seen in the use of instruments aimed at reducing the demand for car travels and in shaping a demand for other alternative forms of transportation, including bicycles. In this approach, called travel demand management or sometimes mobility management [11], it is possible to guarantee the city residents the freedom of choice of their preferred means of transport, however this decision is impacted also by the implementation of a series of instruments that on the one hand increase the competitiveness of means of transport that can substitute a car, and on the other hand, concern introducing certain restrictions for motorized traffic (where this is necessary, especially in areas affected by the congestion, usually in city centres). In the context of promoting bike travels, the implemented instruments are mostly associated with the provision of adequate infrastructure, complemented by wide-ranging marketing, education, information and different campaigns aimed at increasing public acceptance for the implemented projects and the involvement of city residents in the process of their implementation.

This paper presents examples of instruments that are most commonly used abroad to encourage bike travels and an overview of the activities carried out to promote bike usage in Cracow. The paper also identifies Best Practices implemented in the area of Cracow and significant deficiencies in the basic issues and actions necessary to be undertaken in the future.

2. FIRST OF ALL – PROPER INFRASTRUCTURE FOR BIKE TRAFFIC

In terms of bicycle traffic, one of the most important and one of the most effective types of travel demand management are infrastructure-related instruments [1, 11, 19]. They ensure city residents dense, coherent and safe network of cycle paths, providing them with an adequate number of bicycle parking places where they can leave their bikes without being afraid of them being damaged or stolen, or allowing bike rental if one does not have their own bike, is an integral part of an efficient process of encouraging city residents to bike travel. A huge potential of such instruments is related to the fact that they allow to efficiently maintain the current number of users and to encourage people who have been using individual motorized transport, to use bicycles [20]. Infrastructure-related instruments usually relate to [13, 16]:

- the construction of bike roads, including roads within a road lane and separate bike roads,
- implementing facilities for bike users, for instance in form of ramps and lowered curbs,
- providing public parking lots for bikes,
- creating city bike rental systems,
- creating places which would integrate bike system with a public transport system, meaning Bike&Ride systems, etc.

Figures 1 and 2 show examples of good practices in terms of investment instruments used abroad.



Fig. 1. Safe solution for bike traffic through an intersection in Stuttgart

Source: own resources.

Rys. 1. Bezpieczne przeprowadzenie ruchu rowerowego przez skrzyżowanie, Stuttgart

Źródło: zasoby własne.



Fig. 2. Bike & Ride parking at one of a public transport stops in Berlin

Source: www.stadtentwicklung.berlin.de.

Rys. 2. Parking Bike & Ride przy jednym z przystanków transportu publicznego w Berlinie

Źródło: www.stadtentwicklung.berlin.de.

According to the strategy adopted by Cracow in 1993, the priority in bike transport is increasing safety for cyclists by, among others, building a network of bikeways [24]. The aim of a long-term bike policy is to raise the share of bike travels to 5-10% of total travels. According to the authors of the document, the implementation of these assumptions would require the construction of approximately 200 km bikeways [24].

Although with the flow of time, the total length of the elements of bike infrastructure in the city has been constantly increasing, at the end of 2012, Cracow occupied the seventh position in the ranking of Polish cities [17] in terms of the length of a dedicated bike infrastructure¹ to the length of the roads in general. Rzeszów, Wrocław, Białystok, Gdańsk, Toruń and Warszawa were higher in the ranking than Cracow. The dedicated bike infrastructure in the city represented 13% of the length of roads in general, whereas in Rzeszów, this share was 32%, in Wrocław, 20%, and in Białystok, 18%. At the end

¹ Dedicated bike infrastructure involves roads marked with C-13, C-13/C-16, C-16/T-22 signs and traffic lanes for bikes in the roadway.

of April 2014, according to the figures of the City Board of Infrastructure and Transport, the total approximate length of all bike infrastructure elements was 144.955 km, including 114.510 km were bikeways, 21.505 km pedestrian paths with the option of bikeways, 6.905 km, counter-lanes, and 2.035 km, special lanes for bike traffic marked on the roads. In 2013, a total of 8.3 km of bike infrastructure as built.

One of the most serious problems of the existing bike infrastructure in Cracow is the fact that it is very fragmented. The system is not connected in a coherent network, by which the bike travels potential is not fully used. Until now, bike infrastructure was often created 'ad hoc', when renovating or rebuilding projects were taking place, mainly in form of separated roads or pedestrian and bike routes. Where there was no space for a bicycle path, the interest of cyclists was neglected.

In addition, in many cases, the infrastructure was not free from other deficiencies, relating to the non-fulfilment of technical standards adopted by Cracow. The most common deficiencies include: the lack of a minimum width of routes, positioning of obstacles in the gauge of separate bikeways (e.g. lighting poles), using high curbs that threaten the safety of cyclists and may cause a bike damage, the lack of convenient entrances and exits from the street onto the bikeways. Next problem is related to the condition of surface which is often not a high quality or is made of incorrect materials (e.g. cobblestone that is a significant hindrance when using bikeways, especially in autumn or winter periods), as well as improper geometry of infrastructure elements, e.g. using too small radii of horizontal curves.

Unfortunately, the number of general access parking spaces for bicycles is neither on a satisfactory level. At the end of 2012, Cracow occupied a distant 11 position in a ranking of Polish cities in terms of the number of city residents per space in a bike rack [17]. In the city, at that time, there were 326 bike racks and according to the calculation it would have to serve 977 residents, where the top three cities it was as follows: in Gdansk, 190 residents, in Wrocław, 192, and Opole 193 residents. The city, however, decided to gradually increase the number of parking areas and according to the City Board of Infrastructure and Transport, at the end of April 2014, the number of racks in total amounted to 471. The map with a location of racks is available at <http://zikit.krakow.pl/mapa-stojaki-rowerowe.html>. In many cases the construction of a rack can also be a problem, in many of them it is possible to attach the bike to the rack by a wheel and not by a frame, which means that this system does not efficiently protect the bikes against bike thieves.

In the study conducted in 2013, the cyclists also confirmed that there was no adequate infrastructure. The study was conducted within the framework of a project of Cracow Cyclical Dialogue, conducted by the "Cracow the City of Bicycles Association" [3]. The research covered 1600 cyclists and their main assumption was to identify the needs of the Cracow residents in terms of bike infrastructure and to indicate obstacles and barriers that impede the increase of bike travels. The results showed that the cyclists evaluate the condition of Cracow bike infrastructure as "bad". The reserves concern mainly the discontinuity of bikeways, entrances and exits from the bikeways, insufficient length of bicycle lanes and insufficient number of bicycle racks (especially in business areas and close to residential buildings, and universities). The factors that mostly discourage from frequent use of bikes have proved to be: fast and intense car traffic and the risk of bike theft. However the factors that would favour and intensify bike travels would be the development of bikeways and the improvement of their continuity, separating bikeways from sidewalks, increasing the number of bike lanes and the number of places where bike users would safely leave their bikes, as well as the improvement of the technical conditions of bikeways.

Apart from the deficiencies described above, it is also important to mention the positive aspects of the Cracow bike infrastructure. For instance, the city is on the second position, just after Gdansk, in the ranking of Polish cities in terms of the length of one-way streets with two-way direction for bicycles. This is precisely in Cracow, at Copernicus Street the first counter-lane for Polish cyclists was created. Even though the existing bike infrastructure is not free from defects, it is worth underlining that with the flow of time, the quality of newly created bike infrastructure has been improving. This is the consequence of a system solution, applying technical standards for bike infrastructure, implemented by the Decree of the President of the City of Cracow [21] (stipulating details of parameters of paths, quality of surface, etc.) and the execution of bike audits (evaluation of all

investments and reconstruction works conducted by the city hall and other authorities in compliance with city bicycle policy). High quality infrastructure for bike traffic was built on the occasion of the reconstruction of Mogilskie Roundabout several years ago. Other examples of Best Practices from the Cracow region concern a gate for bicycles on Królewska Street (a solution that facilitates making a dangerous and difficult left-turn manoeuvre) as well as a crossing through an intersection only for cyclists on the crossing of Starowiślna and Dietel Street.

In 2008, Cracow, also as the first city in Poland, launched public bike rental services, as part of CiViTAS CARAVEL project [18]. The aim of this solution, at that time, was an innovative one in a national scenario, was to encourage residents and tourists to use bicycles and to increase the share of this form of transport in urban travels. As part of the system of maintenance-free urban bike rental services, initially the users could use about 100 city bikes and 12 bike rental locations. The stations were distributed in the busiest downtown spots, including city passenger transfer points [18]. The operator of the system has changed various times and now it operated under the name of KMK Bike.

Every potential client has to register in the system on the website (www.kmkbike.pl), and bike rental consists in entering a phone number and an individual PIN number on the terminal located on the bike rental station. The bike can be rented for the first 20 minutes free of charge additional time is charged [6].

After 35 days the bicycle rental system was operating, until January 2009, there were 643 persons registered and 204 of them were still active users. During 35 days, the bikes were rented 2761 times. Most bicycles were rented on Grunwaldzkie Roundabout [18].

Since the creation of the system, the city planned to expand the city bike offer to all the city area. During several years of the functioning of the system, the number of stations was subsequently increased as well as the number of bicycles available in bike rental system. In season 2014, 30 stations and 270 bicycles were facilitated. Fig. 3 shows the location of stations (grey spots).



Fig. 3. Location of the stations of public bikes in Cracow. Source: <http://ibikekrakow.com/mapa/>

Rys. 3. Lokalizacja stacji systemu rowerów publicznych w Krakowie. Źródło: <http://ibikekrakow.com/mapa/>

3. SECONDLY – APPROPRIATE PLANNING OF URBAN AREA AND FACILITATING IT TO PEDESTRIANS AND CYCLISTS

Planning instruments for the travel demand management, allow to control the demand for other means of transport, in alternative to cars, through the use of various techniques of spatial planning [1, 11]. Proper planning of urban spaces in the cities of Western Europe frequently uses procedures such as increasing the density of population, the number of jobs of the introduction of multi-functionality of

an area that affects the reduction of the total number of journeys conducted by car, such as those related to the services or work and the increase of the use of environmentally friendly forms of locomotion. The sources and destinations are located close to each other, meaning accessible by bike or on foot, which, with the support of educational and promotional activities can provide a significant increase in bike usage.

Planning instruments may also involve traffic calming by introducing speed limits (e.g. routes on which authoritative speed does not exceed 30 km/h, so-called. TEMPO 30) or traffic flows in passageways and providing technical equipment of streets in form of traffic calming measures (e.g. humps, narrowings, small roundabouts, raised intersections platforms), which makes them more friendly for pedestrians and cyclists. Traffic calming basically ensures safety for all road users, and the cost of such projects is not large (e.g. in the case of changes in the organization of traffic it only involves road signs). Of note, sometimes it can cause some inconvenience for cyclists, speed bumps or equivalent intersections force braking, stopping and re-acceleration. This means that not always does the traffic calming is the right solution and that it should be avoided on main cycle paths. Similarly, when designing speed bumps, their shape should take into account the flat area between the curb and the elevation of the threshold, enabling easy bike ride.

An interesting example of urban planning instrument is also a pedestrianization of squares and streets, usually these of commercial nature. Car traffic is limited and the space is recovered and given back to the pedestrians and cyclists.

With regard to the influence on the demand for bike trips with this type of instruments, it must be emphasized that Cracow was the first city to have opened the Old Town for bikes (until now many cities have failed to do so). All the changes implemented in the traffic organization, particularly those that are evident in the downtown of Cracow give preference, not only cyclists, but also to public transport users and pedestrians. Over the past dozens of years, car traffic was closed down on Florianska Street (in the 60's of XX century) and Market Square (in 1979). In 1988, three traffic accessibility zones were introduced: zone A for pedestrian traffic, zone B for restricted traffic and zone C of restricted parking. The last one was expanded in 2011 and 2014. In 2007, parking lots on the Small Market Square and on Szczepanski Square were eliminated in connection with the celebration of the 750th anniversary of the city, recovering these spaces for pedestrians and cyclists.

In parallel to the described solutions, there were concepts of complex changes of traffic organization in the downtown area of Cracow. The last one was conducted in 2013 [7] and was partially implemented and it's probable that it will be put in practice in the future. In the concept, former documents and versions were revised, small modifications were suggested and the comeback to the idea of one-direction traffic around Planty [10] was suggested, along the I ring-road, changing the internal road into a bikeway and maintaining a two-way traffic of public transport. Thanks to this, passenger cars would be eliminated from the city centre. New traffic organization is to improve the speed of public transport and decrease air pollution in the city centre. What is also very important is the fact that thanks to this solution, the centre of Cracow will become even more attractive for pedestrians and cyclists.

The project of reconstruction of tram track within in the section of the I ring-road that is currently developed from the Philharmonic to the Matejko Square, also includes the introduction of one-way traffic in accordance with the developed concept.

4. THIRDLY – INFORMATION, EDUCATION AND PROMOTION

In terms of the creation of pro-bike behaviours, immensely important is to influence on the opinions and attitudes of commuters with information, marketing and education activities [8, 11]. Data and advice provide users with information on the operation of the means of transport, refer to the analysing and assessing the conditions of journeys conducted by various forms of locomotion and the recommendation the best travel options. Information may be facilitated in a traditional way, by leaflets, brochures or by using latest achievements of IT technology: Internet information platform, or special applications available on the phone. With regard to information campaigns in Cracow, it is

worth to mention a website of IBikeKrakow (<http://ibikekrakow.com/>), that is a great source of knowledge on information on bike routes, location of bike parking places and contains many useful pieces of information on bike travels.

In turn, the main goal of education activities is to influence the transport conscience of the city residents in order to show them that the choices of an individual affect the quality of city communication in short-term and in long-term perspective, so whenever possible, we should use environmentally friendly forms of mobility. Marketing actions promote optional, to individual communication, means of transport, using a wide range of marketing strategies, from leaflets, brochures and gadgets, through an organization of events and happenings, ending with individual talks with city residents.

One of the most popular education and marketing campaigns is the "Sustainable Mobility Week" along with a "Day Without a Car" that take place every year in the cities around the world, including Cracow. The "Sustainable Mobility Week" is now the only education and marketing campaign organized by the City Hall of that is directed to all city residents that promotes bike travels. As part of all-week-long celebrations all kinds of events take place, such as: bike rides, bicycle driving licence exams, educational campaigns in schools and kindergartens, promotion in the mass media. During the campaign, the "soft" actions are always accompanied by certain investment activities. The most commonly implemented include: the construction of infrastructure for cyclists, such as bikeways, parking lots for bikes, marking of bicycle routes, or temporary closure of selected communication routes for car traffic.

In terms of education activities, project CiViTAS CARAVEL also contributed interesting experiences. The aim of one of the actions was to inform the city residents of, on the one hand, the threat that the expansive use of cars brings, and on the other, of the benefits resulting from the choice of environmentally transport, including bikes. A large number of undertaken actions was directed to young people, meaning to those that will decide on the fate of our cities in the future in the perspective of several decades [18].

However, most of the education and marketing actions in Cracow that were organized by the City Hall to promote cycling concerned selected target groups, mostly children or students of Cracow universities. For instance, in the framework of the campaign "Mobile Cracow"² implemented by, among others, Cracow City Hall and the Foundation Partnership for Environment, middle schools and high schools of the Cracow Metropolitan Area were encouraged to implement concepts relating to the programs aimed at increasing the use of environmentally friendly modes of transport in commuting for working people and students. The first edition of the campaign was led from September 2012 to April 2013 covered several schools whose ideas were rewarded by subventions for their actions, including solutions for bike travels. Another example is the currently implemented UE project "Stars", whose goal is to also increase the number of bike travels among children and youth, related to commuting to school. Within the framework of the project, workshops for schoolchildren and teachers are organized and various marketing strategies and campaigns are used.

In terms of promoting bikes among university students, it is also worth to mention the actions implemented by the Cracow University of Technology. Under CiViTAS CARAVEL project, the university has implemented the first in Poland, mobility plan including many information, promotion and education actions relating to bike traffic [12]. An information website was created www.infokomunikacja.one.pl, which is a compendium of knowledge on using environmentally friendly means of transport in the city, including a bicycle. The first-year students were handed information brochures on how to easily commute between university buildings in a sustainable way, very often very popular bike happenings were also organized.

Although information, promotion and education campaigns on bike traffic are also carried out in Cracow by different ONGs and bike associations, it is necessary that the City Hall carries out a bigger number of such actions, particularly those that aim at increasing the transport awareness and creating a positive image of bicycles, especially among individual motorized transport users.

² http://www.krakowmobilny.pl/Krakow_mobilny_dla_szkol.htm

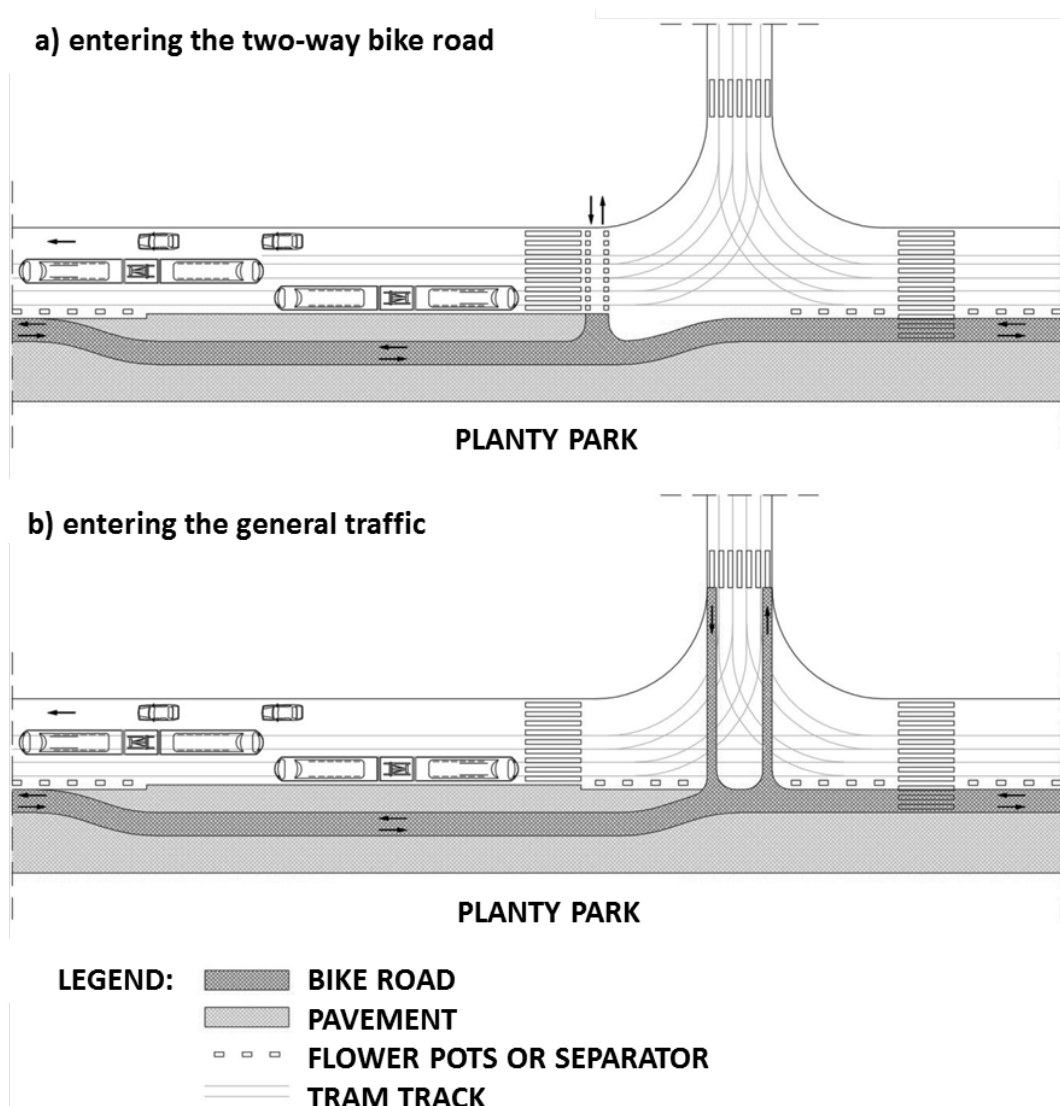


Fig. 4. The concept of new traffic organization along the I ring-road. *Source:* [7]

Rys. 4. Koncepcja nowej organizacji ruchu wzdłuż I obwodnicy. *Źródło:* [7]

5. FOURTH – INVOLVEMENT OF THE SOCIETY ON THE IMPLEMENTATION OF PROJECTS

When implementing transport demand management instruments, it is very important to engage and involve the addressees of the project in its execution, as the aim of the solutions is to facilitate the travel conditions for these addressees particularly and the attempt to shape their communication behaviours [9]. The residents have to realize that they have a real impact in the shape of the actions that are implemented and that will serve to satisfy their communication needs, but also in fulfilling certain social goals, such as reduction of congestion, or decreasing of air pollution. Social involvement should take place at the early stages of planning process. It is crucial to include all entities and stakeholders and to assure coordination by a unit, or group that is represented by cooperating parties.

The practice of public consultation is a very effective tool for the implementation of controversial and innovative projects, that carry benefits that are not always clearly visible (e.g. regarding restrictions for motorized traffic). In such cases it helps to gain acceptance for these solutions and to minimize the resistance of the residents.

In Cracow these public consultations have the form of meetings with residents, education actions conducted in media or organized cyclically, so called the Mobility Forum that is a platform of the exchange of ideas between authorities, experts and residents as well as a space for open debate that enables that the city residents express their ideas and different points of view on transport issued in the city.

In the context of involving Cracow society in deciding on the shape of the bike policy for the city it is important to remind of the Cracow Cyclical Dialogue (2013) [22]. Participative project of the Cracow Cyclical Dialogue, when compared to other activities of such type carried out in Cracow seems to be specific and can be defined as best practice. First of all, due to the organizer of the social consultations, the Association Cracow the City of Bicycles that has invited all the residents of the city to the cooperation, and on the other hand, they have invited the representatives of traditional decision-makers in the area of bike policy, represented by the City Board of Infrastructure and Transport [3]. So, the initiative that aimed at providing the Cracow residents a real impact on the improvement of the situation of cyclists in Cracow came from the III sector, meaning the core of the civil society. This fact gave a favourable level of social trust at the very beginning of the process. Secondly, the process was carefully designed and was put in practise in a very systematic way. As a result, the participation of a broad representation of residents at all stages of the project was ensured, a mapping of stakeholders was made and favourable conditions for their participation were provided. Workshops and district public consultation that were organized in the framework of the project, were supported by the impartial moderators, whose task was to improve the group process, empower working efficiency and uphold the principles of deliberation.

Under the project, during workshops, the residents prepared tangible solutions concerning weaknesses, availability and continuity of cycling infrastructure, as well as developed proposals that were subject to discussion in the district consultations.

The crowning of the process was called. "100 Solutions Contract", containing a list of postulates, including minor solutions, such as, among others, lowering curbs on cycling paths, but also a higher-calibre matters, such as adequate communication of the city centre with certain districts [22]. The 100 Solutions Contract was submitted to a city unit that is responsible for the bike infrastructure so that funds from the city budget and Long-Term Financial Plan were provided, so that in the perspective of 2-3 years the solutions requested by the residents are implemented. In the meantime in the City Board of Infrastructure and Transport, a Section of the Implementation of City Bicycle Policy was established with a participation of a representative of the society, meaning a bike officer. He became a spokesperson of cyclists and he will undertake actions that are to implement the postulates of the Contract [3].

The described social consultation process and the creation of "100 Solutions Contract" has the chance to change the Cracow road infrastructure into space that is friendly for pedestrians and cyclists. A list of proposals that were sorted according to categories and presented in form of colorful cells is available on the website ibikekrakow.com.

A very important element of the social involvement in bike city actions is also a bicycle audit. Thanks to that, everyone can file comments for the project of a built or reconstructed street or a bike road. In order to participate in a bike audit, enter a website of ZIKiT (City Board of Infrastructure and Transport) and select the page "Bike audits" (zikit.krakow.pl/audyty-rowerowe). In this place it is possible to check what audits are being conducted currently and learn the designs of a new bikeways. In case of objections, the residents may send them by e-mail onto the address stated in the project.

6. SUMMARY

It is believed that it was in Cracow where the cycling revolution started in Poland in the 90's. Here is where the first bike demonstrations were organized and where the initiative of "City for Bikes" was born. This city, as the first in Poland implemented (in 1993) the provisions of bike traffic to its Transport Policy, although its current state still differs from these provisions.

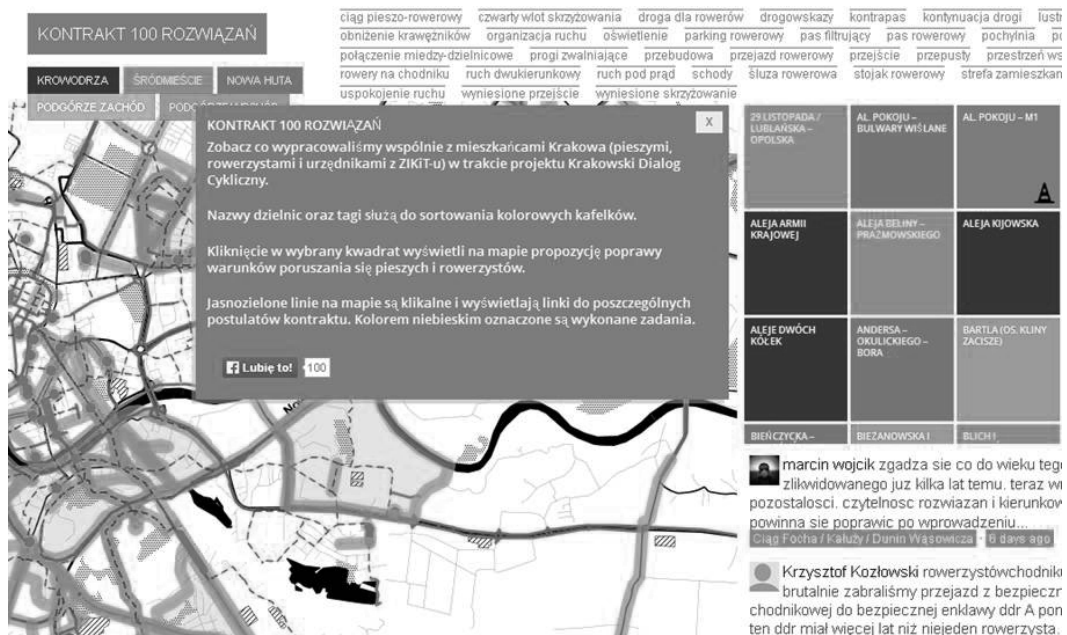


Fig. 5. “Contract 100 solutions” shown in form of coloured blocks. Source: ibikekrakow.com
 Rys. 5. „Kontrakt 100 rozwiązań” przedstawiony w formie kolorowych kafelków. Źródło: ibikekrakow.com

The examples of solutions relating to the stimulation of demand for bicycle trips, presented in this paper, represent a small part of all actions undertaken in Cracow, by the city and other entities to promote cycling. Best Practices conducted in the city concern in particular the implementation of innovative solutions, such as gates at intersections, special lanes for cyclists along the roads, or even controversial project of one-way bike traffic around the Planty. Cracow was the first city in Poland to have opened the Old Town for cyclists, to have introduced counter-lanes and have launched a public bike rental system. Apart from some deficiencies of the existing system, the city keeps providing the missing elements of the linear and punctual infrastructure. Through the use of technical standards and the implementation of bike audit, the conducted solutions are of very high quality. These projects should be very much intensified in the future and the funds for their execution, secured in the city budget.

The main challenge that the city will face is to create, based on verified quality requirements [21], a coherent and continuous network of bikeways. It is optimal to use the length of bike network to the length of public roads, as an indicator. It should definitely reach 1:1 [4], assuming that the bike infrastructure is not only bikeways, but also lanes for bikes in the roadway or calm traffic streets (TEMPO 30), including one-way streets with two-way bike traffic. Additionally, planning of the development of bike traffic infrastructure should be fully integrated with the spatial planning implemented by the city.

It is also necessary to shape the pro-bike attitudes and communication behaviours through the organization of educational and marketing activities aimed at all the population and to provide information on the functioning of the system, especially when using the latest achievements of IT.

The examples that are commonly used abroad are missing in Cracow, such as fiscal instruments [11], for example, that would gratify bike commuters (e.g. bonuses paid to the employees or concessional loans to purchase a bike provided by the employer, supported by the city). The only solution that contemplated a fiscal factor and that is planned to be implemented by the city is the possibility to use the city bikes free of charge for several hours. This option will be available for Cracow City Card holders that have purchased a season travel card for all public transport lines. In the context of the integration of these two systems, Cracow should also think of the next step of their integration, namely creating Bike&Ride parking places in transfer points, close to railway stations and at the stops and bus and tram loops.

The given example of the Cracow Cyclical Dialogue can indicate that the shape of the city can be changed also by means of long and sometimes, exhausting, dialogue with the society and common, generally available internet tools. This Best Consultation Practice should, then, be continued at a large scale.

Hence, Cracow is still a city that is friendly to cyclists and has a large potential of the development of bike communication that, if properly used, can cause a significant increase of the share of a bicycle in travels.

Acknowledgement

This paper is involved with CIVITAS CAPITAL project: "Making the best of CIVITAS!" The project has received research funding from the Community's Seventh Framework Programme. The paper reflects only the author's views and the Community is not liable for any use that may be made of the information contained therein.

References

1. Berloco, N. & Colonna, P. Testing and Improving Urban Bicycle Performance. *Procedia - Social and Behavioral Sciences*. 2012. Vol. 53 P. 72-83.
2. *Civitas Initiative*. Available at: <http://www.civitas.eu/>
3. *Czego pragną rowerzyści*. Raport z badania ankietowego potrzeb krakowskich cyklistów pod kątem infrastruktury rowerowej. Kraków. 2013. Available at: <http://www.slideshare.net/KrakowMiastemRowerow/czego-pragn-krakowscy-rowerzyci-raport-z-badania-krakwmiastemrowerw> [In Polish: *What do cyclists want. Report on questionnaire research on Cracow cyclists in terms of bike infrastructure*. Cracow. 2013].
4. Hyla, M. *Polityka rowerowa w Krakowskim Obszarze Metropolitalnym: Smart Mobilit*. Warsztat V - SMART MOBILITY. Krakowski Park Technologiczny. Kraków. Luty 2014. [In Polish: Hyla, M. *Cycling policy in the Cracow Metropolitan Area: Smart Mobility*. Workshop V - SMART MOBILITY. Cracow Technology Park. Cracow. February 2014].
5. *IBikeKrakow*. Available at: <http://ibikekrakow.com/>
6. *Krakowskie Rowery Miejskie*. Available at: <http://www.kmkbike.pl> [In Polish: *Cracow City Bikes*]
7. Kulpa, T. z zespołem. *Koncepcja zmian w organizacji ruchu drogowego w śródmieściu Krakowa. Ekspertyza na zlecenie ZIKiT w Krakowie*. Kraków. 2013. [In Polish: Kulpa, T. & others. *The concept of changes in the traffic organization in the downtown of Cracow. Expert report commissioned by ZIKiT in Krakow*. Cracow. 2013].
8. Lanzendorf, M. & Busch-Geertsema, A. The cycling boom in large German cities – Empirical evidence for successful cycling campaigns. *Transport Policy*. 2014. Vol. 36. P. 26-33.
9. Lindenau, M. & Böhler-Baedeker, S. Citizen and Stakeholder Involvement: A Precondition for Sustainable Urban Mobility. *Transportation Research Procedia*. 2014. Vol. 4. P. 347-360.
10. Melanowski, Z. & Rudnicki, A. & Trząski, M. Komunikacja w Śródmieściu Krakowa - koncepcje uspokojenia ruchu. *Zbiór referatów Konferencji Naukowej PAN-SITK-PK „Organizacja ruchu w śródmieściu”*. Kraków-Nowy Sącz. 1986. [In Polish: Melanowski, Z. & Rudnicki, A. & Trząski, M. Transport in the city center of Cracow - traffic calming concept. *Proceedings of Scientific Conference PAN-SITK-PK "Organization of traffic in the downtown"*. Cracow-Nowy Sącz. 1986.].
11. Nosal, K. & Starowicz, W. Wybrane zagadnienia zarządzania mobilnością. *Transport Miejski i Regionalny*. 2010. Vol. 3. P. 26-31 [In Polish: Nosal, K. & Starowicz, W. Selected aspects of mobility management. *Urban and Regional Transport*. 2010. Vol. 3. P. 26-31].
12. Nosal, K. Zintegrowany plan mobilności dla Politechniki Krakowskiej, jako przykład zaspakajania potrzeb komunikacyjnych pracowników i studentów oraz zarządzania ich mobilnością. *Transport Miejski i Regionalny*. 2008. Vol. 7-8. P. 26-29 [In Polish: Nosal, K. Integrated mobility plan for

- the Cracow University of Technology, as an example of meeting the communication needs of staff and students and manage their mobility. *Urban and Regional Transport*. 2008. Vol. 7-8. P. 26-29].
13. Parkesa, S. D. & Marsdena, G. & Shaheenb, S. A. & Cohenb, A. P. Understanding the diffusion of public bikesharing systems: evidence from Europe and North America. *Journal of Transport Geography*. 2013. Vol. 31. P. 94-103.
 14. *Polityka transportowa dla miasta Krakowa na lata 2007 – 2015*. Załącznik do uchwały Nr XVIII/225/07 Rady Miasta Krakowa z dnia 4 lipca 2007 r. [In Polish: *Transport policy for the city of Cracow for the years 2007-2015*. Annex to Resolution No. XVIII/225/07 Cracow City Council dated 4 July 2007].
 15. Pracownia Badań Społecznych. *Kompleksowe Badania Ruchu KBR 2003. Podsumowanie I Etapu prac*. Sopot. 2004 [In Polish: Social Research Laboratory. *Comprehensive Traffic Research KBR 2003. Summary of first stage of the work*. Sopot. 2004].
 16. Puchera, J. & Dillb, J. & Handyc, S. Infrastructure, programs, and policies to increase bicycling: An international review. *Preventive Medicine*. 2010. Vol. 50. Supplement. P. S106-S125.
 17. *Raport – Polska na dwóch kółkach*. Available at: http://opole.gazeta.pl/opole/1,35086,13013590,Te_miasta_dbaja_o_rowerzystow__RAPORT_.html [In Polish: *Raport – Poland on two wheels*].
 18. Rudnicki, A. z zespołem. *Innowacje na rzecz zrównoważonego transportu miejskiego. Doświadczenia z realizacji projektu Unii Europejskiej CIVITAS-CARAVEL*. Kraków: PiT. 2010 [in Polish: Rudnicki, A. & others. *Innovations for sustainable urban transport. Experience of the European Union project CIVITAS-CARAVEL*. Cracow: PiT. 2010].
 19. Schepersa, P. & Hagenziekerb, M. & Methorsta, R. & van Weed, B. & Wegmanb, F. A conceptual framework for road safety and mobility applied to cycling safety. *Accident Analysis & Prevention*. 2014. Vol. 62. P. 331-340.
 20. Schweizer, J. & Rupi, F. Performance Evaluation of Extreme Bicycle Scenarios. *Procedia - Social and Behavioral Sciences*. 2014. Vol. 111. P. 508-517.
 21. *Standardy techniczne dla infrastruktury rowerowej Miasta Krakowa*. Załącznik do zarządzenia nr 2103/2004 Prezydenta Miasta Krakowa z dnia 26 listopada 2004r. [In Polish: *Technical standards for bicycle infrastructure of City of Cracow*. Annex to the Regulation No. 2103/2004 of the President of the City of Cracow on 26 November 2004].
 22. *Stowarzyszenie Kraków Miastem Rowerów*. Available at: <http://kmr.org.pl/> [In Polish: *Cracow The City of Bicycles Association*].
 23. *The EPOMM Modal Split Tool*. Available at: <http://www.epomm.eu>
 24. *Zarys polityki transportowej dla Krakowa*. Załącznik do uchwały Nr LXX/468/93 Rady Miasta Krakowa z dnia 8 stycznia 1993 r. [In Polish: *Outline of transport policy for Cracow*. Annex to Resolution No. LXX/468/93 Cracow City Council dated 8 January 1993].
 25. *Zarząd Infrastruktury Komunalnej i Transportu w Krakowie*. Available at: <http://zikit.krakow.pl> [In Polish: *City Board of Infrastructure and Transport in Cracow*].