

Measure title: **Clean high mobility corridor**

City: **Krakow**

Project: **Caravel**

Measure number: **8.3**

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## **A Introduction**

### **A1 Objectives**

The measure objectives are:

- introducing Clean High Mobility corridor in Krakow
- implementing two tram stations with “model” character in terms of accessibility, safety and information provision at these corridor
- realizing a comprehensive strategy to improve PT security and safety (including speed reduction near PT stops)
- Implemented technology of sound and visual information in trams and buses.
- improving PT infrastructure in the city centre, especially for elders and disable people (i.e. adjusting the height of platforms) and reduce passenger boarding and alighting time.

### **A2 Description**

To keep a good image of current public transport services among citizens and to keep the modal split on the same level as it is now in Krakow, new solutions concerning safety of the public transport passengers and new information services for passengers should be created. Usage of the new vehicles with new fuelling solutions (e.g. CNG buses) and buses meeting the gas emissions standards (Euro II, III, IV) will help create a good image of public transport system in Krakow - safe, economically efficient and environment friendly.

Closely integrated policies for clean vehicle use, passenger security, ticketing, institutional innovation, new flexible services aim at bridging the gap between high-volume public transport and private car-based transport, and services addressing new demands in intermodal leisure-related mobility will be demonstrated. Important elements such as new type of bus/tram stops and use of clean buses in the clean high mobility corridor will also be demonstrated.

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## **B Measure implementation**

### **B1 Innovative aspects**

The innovative aspects of the measure are:

- **Technology of sound and visual information in tram and buses** – New approach in Krakow to passenger information in vehicle.
- **Tram stations with model character** – Model character in terms of accessibility, safety and information provision. The tram stops placed on lines built in the street pavement are presently on the same level as vehicle lanes. The main idea is to shift the area of the stop to the level of curb to ensure easier accessibility of the

tram and improve safety of the boarding passengers. Moreover to the all model stops there will be provided real time information about departure time of PT lines.

- **Strategy to improve PT security and safety** – speed reduction near PT stops, adjusting the height of platforms etc.
- **Separated traffic lanes** - Separate lanes for public transport vehicles can reduce the transit time between stops, which affects a significant improvement in throughput transport corridor.

## B2 Situation before CIVITAS

The public transport operator in Krakow (MPK) has been very active in setting up new PT services, addressing institutional and commercial efficiency (e.g. MPK is a profit-making company). PT has the central role to ensure accessibility and both aim to increase the already high levels of public transport usage.

## B3 Actual implementation of the measure

The measure was implemented in the following stages:

- **Stage 1: Tram stations** (03.06-01.07) – Two trams stations with “model” character in terms of accessibility, safety and information provision at these corridors was build at Lubicz street.
- **Stage 2: Visual and sound information system** (10.07 – 03.08) – Installation visual and information system in tram vehicles. The new system of voice information for passengers, especially announcing the next stops, is based on the present position of the tram, either calculated by using a "road module" (counting meters travelled) or by using a GPS positioning system was installed.
- **Stage 3: Strategy to improve PT security and safety** (03.06 –10.08) –A comprehensive strategy with reduction speed near by “model” trams stations, adjusting the height of platforms on trams stations to vehicle board level was created.
- **Stage 4: Environment friendly vehicles:** (01.07 – 05.08) – Public Transport Operator in Krakow (MPK S.A.) was withdraw from the operation of old buses are not meeting the standards of EURO. All vehicles of MPK S.A. meets the EURO II, III, IV standards.

## B4 Deviations from the original plan

The deviations from the original plan comprised:

Abandonment of installation of information system at model stops. The information system on stops planned in accordance with the Inception Report, was closely related to the planned investment Kraków Fast Tram. This big investment project includes UTCS (Urban Traffic Control System) within the corridor of Fast Tram, and partially within new clean high mobility corridor. Lack of GPS positioning system for all trams in Krakow, makes not possible installment of information system and 2 selected before stops. In this connection, the deadline to complete that scope as provided for in the measure is not possible. Thus it has been changed into installment of sound and visual information systems on board (in trams and buses). This deviation has been presented to the EC during Mid-Term Review process, and accepted.

## B5 Inter-relationships with other measures

The measure is related to other measures as follows:

- **Measure 5.3** – Clean vehicle will be use on routes inside clean high mobility corridor
- **Measure 8.6** –Demand responsive buses be linked with clean high mobility corridor
- **Measure 8.11** - Improve of safety inside clean high mobility corridor will be developed with de plan
- **Measure 12.6** - Public transport priority system will be implemented on routes inside clean high mobility corridor.

## C Evaluation – methodology and results

### C1 Measurement methodology

#### C1.1 Impacts and Indicators

*Table of Indicators.*

Evaluation Category	N°	Indicator	Source of data	Methodology for indicator construction (survey, modelling, etc)	Baseline date
Economy	1	Operating revenues	MPK	Survey	06.2008
Economy	2	Operating costs	MPK	Modelling	06.2008
Transport	15	Perception of PT accessibility	UMK	Survey	06.2008
Transport	19	Quality of public transport services	UMK	Survey	06.2008
Transport	20	Transport safety	UMK	Survey	06.2008
Transport	NEW	Speeds lowering	UMK	Survey/ Modelling	06.2008
Transport	NEW	Growth in passenger volume	MPK	Survey	06.2008
Transport	NEW	Reducing of passenger services time at stop	UMK	Survey/ Modelling	06.2008

Detailed description of the indicator methodologies:

- **Operating revenues** - is defined as the ratio of total income generated from fares and tickets divided by the total passenger-km or vehicle-km completed by the service in a given time period (for example day, week, month or year).
- **Operating costs** - Operating cost is defined as the ratio of total operating costs incurred by public transport users and car users. The unit of indicator is €/pkm.
- **Perception of PT accessibility** - index of the value “accessibility perception” of every surveyed person.
- **Quality of PT services** - index of the value “perception” of every surveyed person.
- **Transport safety** – index of the value “safety perception” of every surveyed person.

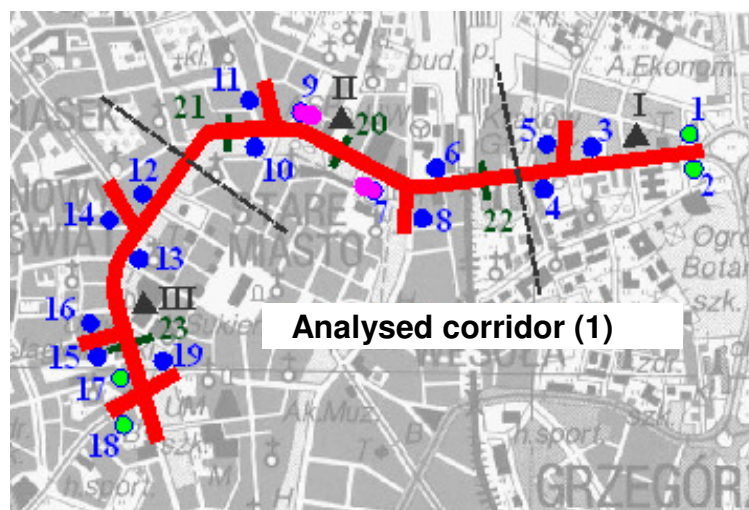
- **Speeds lowering** - percentage of average speeds lowering of individual cars at streets with model stops implemented.
- **Growth in passenger volume** – percentage of growth in passenger volume.
- **Reducing of passenger services time at stop** – percentage reducing passengers boarding and alighting time at model stops.

Proposed indicators will be estimated not on whole length of corridor, but only in the part inside the city centre. The main reason of such choice is, that outside the downtown area, traffic conditions are not so heavy and influence of implemented changes will not be significant.

## C1.2 Establishing a baseline

The values of indicators were defined according to survey made on July 2006. Those measurements include unbiased measures, such as punctuality, running time, occupancy of PT vehicle and also results of surveys, such as passengers' opinions about most important features of PT operation. The survey state the part of measurement conducted within measure 12.6.

For the evaluation purpose there were taken chosen results estimated in corridor one:



## C1.3 Building the business-as-usual scenario

## C2 Measure results

### C2.1 Economy

Chosen indicators were not able to estimate due to sensitive character of the data. Due to opening PT market for external companies (previously MPK was the only PT company in the city) it is not possible to obtain necessary values of operating costs and revenues[MSOffice1].

Operating cost and operating revenues – unable to estimate.

### C2.2 Energy

No indicators related to this group.

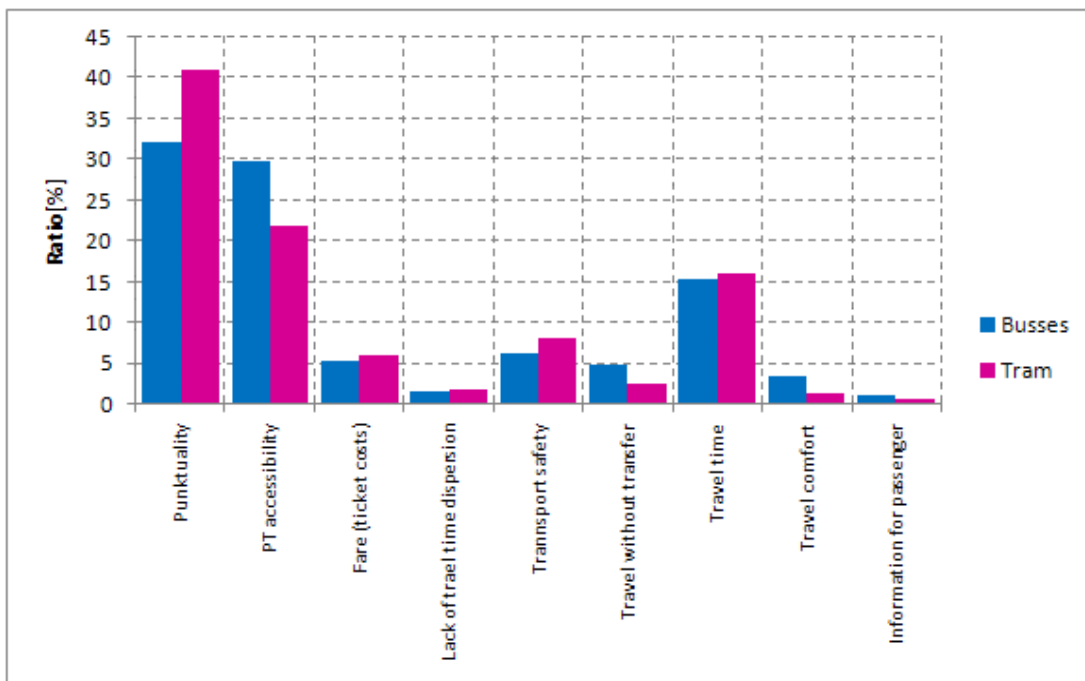
### C2.3 Environment

No indicators related to this group.

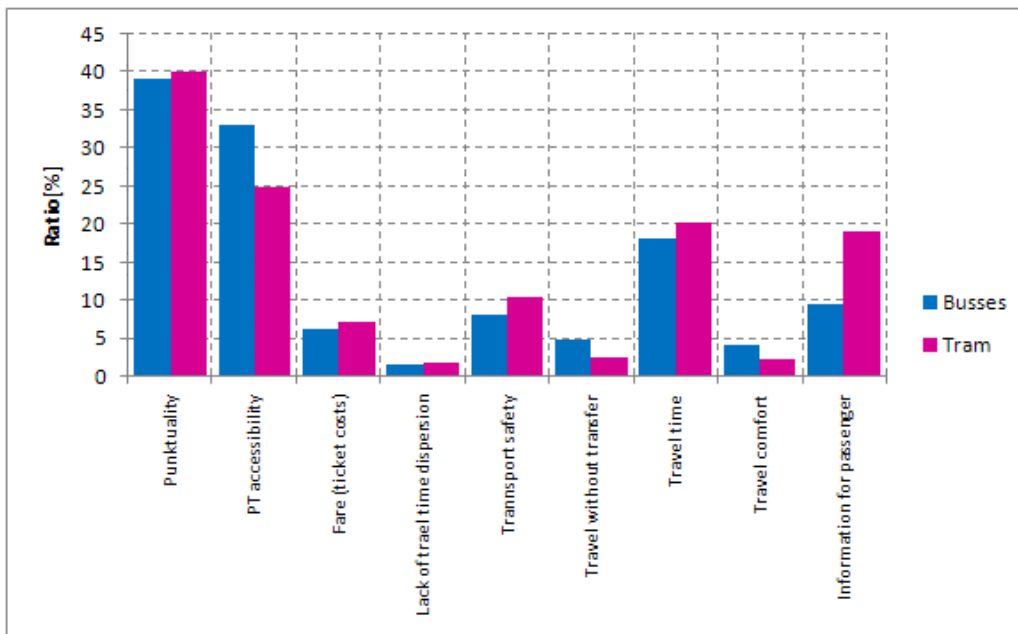
### C2.4 Transport

- **Quality of public transport services** – some surveys were made of the most important features of PT operation in Krakow. Surveys were made at both corridors (at the tram and bus stops). In passengers' opinion the most important is punctuality, very big meaning has also PT accessibility and travel time(C2.4-1).

C2.4-1.Situation "before" - October 2006



C2.4-2 Situation "after- September 2008



As the graph shows the most relevant factors for passengers during their journey are still: punctuality, PT accessibility travel time and information for them (C2.4.-2). The last two indicators have grown up in comparison with the "before" situation – in October 2006(C.2.4-1).

- **Transport safety** – Indicator of transport safety is presented at fig. C.2-4-1 and C.2-4-2. In passengers opinion, PT safety was increased by ca. 5%
- **Perception of PT accessibility** - Indicator of perception PT accessibility is presented at fig. C.2-4-1 and C.2-4-2. In passengers opinion, PT accessibility was increased by ca. 5%
- **Reducing of passenger services time at stop** - Improvement of passengers boarding and alighting time at model stops is a result of adjusting height of platforms.( C2.4-3)

	Model stop	Reducing of service time [%]
	Lubicz – Mogilska	10%
	Lubicz - Basztowa	10%

C2.4.-3- Reducing of service time at stop – statistic data

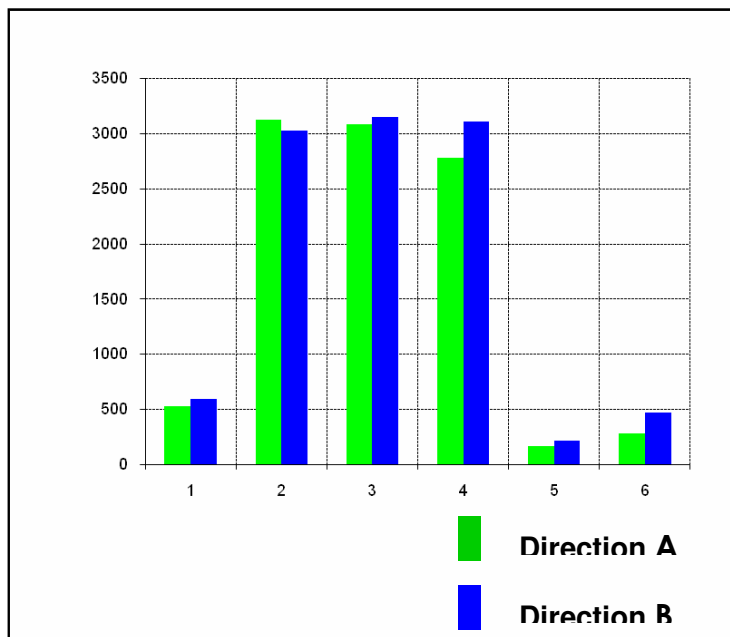
• **Growth in passengers volume**

During the conducted survey, the detailed values of passengers volume were obtained during the period 6.00-20.00 and the values were assigned to calculated peak periods.

*C2.4.-4- The main bus stops , which were used in the measurement in the year 2006 and 2008*

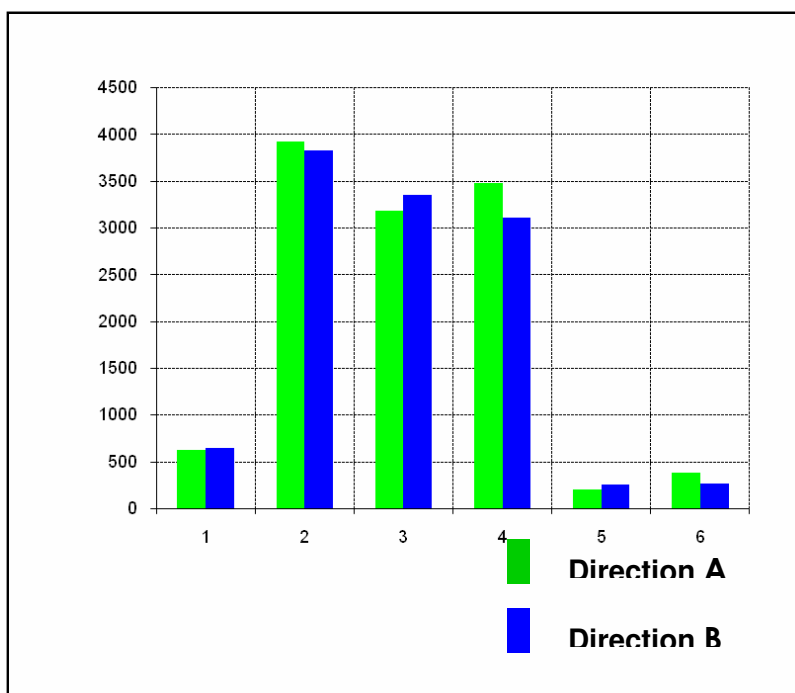
Nr.	Localization	Start	End
1	Królowej Jadwigi	Słonecznikowa	Piastowska
2	Basztowa	Pl. Matejki	Dworzec PKP
3	Lubicz (pod wiaduktem)	Rakowicka	Dworzec PKP
4	Lubicz	Rakowicka	Rondo Mogilskie
5	Most kotlarski	-	-
6	Lipska	Węglarska	Os. Lipska

*C2.4.-5- The measurement volume of passengers from 15 to 16 in the year 2006 in both direction*



The graph shows that the number of passengers at the second, third and fourth bus/trams stops are quite big. First of all, these buses stops are in the city centre, where buses and trams are mainly means of transport using by passengers (C.2.4.-5).

C2.4.-6- The measurement volume of passengers from 15 to 16 in the year 2008 in both directions



The situation “before” and “after” the measurement are very similar. Still the most important bus stops are the second, third and fourth and the volume of passengers at this stops have grown (C.2.4-6).

**Speed lowering** - Average speeds of individual cars was measured at streets near the model stops.

	Average vehicle speed	
	Model stops nr 1 Lubicz - Mogilskia	Model stops nr 2 Lubicz – Basztowa
<b>Situation “before”</b>	33,5km/h	30,2km/h
<b>Situation “after”</b>	23,1 km/h	20,9 km/h

C2.4-7 Average vehicle speed

Adjusting street level to the height of platforms, allowed reduction of average speed to 10 km/h.

**C2.5 Society**

No indicators related to this group.



### C3 Achievement of quantifiable targets

No.	Target	Rating
1	Implementation of two tram stations with “model” character in terms of accessibility, safety and information provision at these corridors.	**
2	Realization of a comprehensive strategy to improve PT security and safety (including speed reduction near PT stops).	**
3	Implemented technology of sound and visual information in trams and buses.	**
4	Improving PT infrastructure in the city centre, especially for elders and disable people (i.e. adjusting the height of platforms) and reduce passenger boarding and alighting time.	**
<b>NA = Not Assessed   * = Not achieved   ** = Achieved in full   *** = Exceeded</b>		

### C4 Up-scaling of results

All aspects of the measure were tested in the part of Clean High Mobility Corridor. Innovative solutions can be extended on other parts of the City. The most important aspects of Clean high mobility corridor in point of view PT, is:

- voice information system - extend to all tram and buses of PT operators,
- separated lanes for PT vehicles on main streets of Krakow,
- adjusting the height of platforms for reducing vehicles speed near by the stops and improvement conditions for elders and disable people.

The majority of aspects were achieved, but some of them should have done better for example to install more bus lanes.

Thanks to this project, we have communicated that PT infrastructure in the city centre should be accessible and fitted for everybody, especially for elders and disable people. Public transport should be designed in such a way that we can use it with a pushchair or wheelchair.

Some of this suggestions such as adjusting street level to the height of platforms, which allowed reduction of average speed to 10 km/h or voice information system in trams, should be used in the future by the city authorities, but not only in the city centre, but also in other Krakow’s suburbs. These improvements ought to be implemented gradually.

Through the solutions and strategies which realize the idea of clean high mobility corridor (conceptual designs, improving PT infrastructure, priority to buses- bus lanes e.g.) Public Transport could be more friendly and safer for the community.

### C5 Appraisal of evaluation approach

In general the approach used for the measure evaluation is appropriate. The comparison of situation “before” and “after” measure implementation is the most common method of evaluation. The measure evaluation is based on surveys. During the surveys for “before” and “after” situation the respondents were asked for example about punctuality and accessibility of PT, travel time and travel comfort. Answers from these questions and the others allow to determine mainly the value of the following indicators: transport safety, perception of PT accessibility, quality of public transport services. The rest indicators were obtained during measurements which allowed to estimate growth in passengers volume and the other indicators. However, in general, approach seems to be adequate some indicators do not properly asses how the Clean high mobility corridor improve of PT. Some indicators like operating cost, operating revenues seems to be unnecessary and are difficult to estimate

## C6 Summary of evaluation results

The key results are as follows:

- **Key result 1** – High value of indicators “Information of passenger” in situation “before” system implementation (presented in part C.2 of MERS)
- **Key result 2** – All buses operating in public transport meets high level of EURO standards.
- **Key result 3** – Two model tram stations improve accessibility, safety and passenger service time.
- **Key result 4** – Adjusting street level to the height of platforms, allowed reduction of average speed to 10 km

## D Lessons learned

### D1 Barriers and drivers

#### D1.1 Barriers

- MPK will fail with application for grant for CNG buses and will have to change a project in that range
- Delay in project of modernization of road system
- Problems with coordination of delivery of new tram fleet for MPK and purchase of sound and visual systems by UMK.

#### D1.2 Drivers

- Politicians involved in the project
- Involved of local ecology organizations
- Involved of public transport operator

### D2 Participation of stakeholders

- **Public Transport Operator** - voice information system improve quality and passenger comfort. Solution on model stops, reduced passenger service time.
- **Passengers** – Clean high mobility corridor improve PT quality.

### D3 Recommendations

**Recommendation 1** – To improve of PT passenger information, all tram and buses should be equipped for voice information system about next stop.

**Recommendation 2** – Separate lanes for public transport vehicles can reduce the transit time between stops, which affects a significant improvement in throughput transport corridor. Lubicz street is an example how this solution should be implemented on other PT corridors.

**Recommendation 3** – Model stops is an good example of adjustment of public transport infrastructure in the city center for the elderly and disabled and to improve the safety of passengers at stops.

## **D4 Future activities relating to the measure**

Future activities related to measure can be stated as below:

- Extension of the voice information system to all PT trams and buses,
  - Adjustment of the height of platforms for all stops on 1<sup>st</sup> road ring.
  - Creation of separated lanes for PT buses on mains streets of Krakow.
-