

# TRAM SYSTEMS IN POLAND –From Neglect to a Recognition of Great Potentials

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**ABSTRACT:** Extensive tram-based urban public transport networks in 19 Polish cities were for long considered obsolete and were neglected, in spite of many of them having a precious feature – a partially exclusive right-of-way on city streets. The focus of planners and authorities was on metros. In the late 1990s, a combined effect of modest public budgets available to cities, the rise in traffic congestion, and apparent public affection for this mode, has led cities like Krakow, Katowice, Poznan, Wroclaw and Warsaw to start rehabilitation and upgrading programs for tram systems. The results in terms of passenger attraction have been positive, but the progress and spread of these programs has been slow. The paper describes evolution of views and actions which have been taken in some cities with emphasis on political/psychological reasons of the long neglect of potentially attractive tramway systems.

## 1. INTRODUCTION

Poland is an interesting case of the Central European country in which tram-based systems were long considered as an obsolete urban transport means. Well-developed tram networks have been operating in 19 agglomerations and cities. But till the late 1980, development plans focused on new metros in 12 of these cities, which in turn led to the neglect of existing systems. These plans were obviously unrealistic because of low financial capacity of the government, not to mention that traffic volumes were far below metro thresholds. Only one project – metro in Warsaw – has been implemented. However, even in this case metro construction has been very slow (15.7 kilometers in 18 years).

The paper describes evolution of views and actions, which have been taken in several cities with emphasis on political/psychological reasons of the long neglect of potentially attractive tramway systems.

### 1.1 *Public transport in Poland in transition period*

In the post-war period, cities in Poland, as in other centrally planned economies of the Central Europe, were relying on public transport services as the main transport mode. Until early 1970's, auto ownership and use were at a low level. Low-priced tramways, bus and commuter railway services, were offered by state-owned, monopolistic public transport companies.

Operating deficits and investment were subsidised from the state budget. Very ambitious investment plans for urban public transport (UPT) were formulated. As a rule, in large and even mid-size cities, these plans provided for the construction of new rail systems – metros and light rail. However, the costs of these systems were so high that only a fraction of these plans could be implemented.

A transition from a centrally planned to a market economy, which started at the end of the 1980's had an important impact on UPT. State spending to subsidise PT companies was reduced and a process of decentralisation gave the municipal governments a wide scope of jurisdiction over local services, including UPT. The strong pressure to reduce subsidies led to sharp fare increases. Accompanied with the rapid growth of motorization, this caused modal shift from public transport to individual transport. The share of public transport in cities dropped from 80-85 % to 50-60%. The total annual number of passengers carried by Polish urban transport operators fell from 9 billion in 1985 to 5 billion at the end of the century. Still, it is estimated that, at present, 22 million people are served by UPT. This constitutes 57% of the country's population.

Changes have brought about not only a substantial reduction of urban PT deficit but also the reduction of expenditures for the repairs, fleet replacement and

modernisation, and development of infrastructure. All these have reduced the attractiveness of public transport. At the same time road congestion started to be a common occurrence. This has affected the performance and costs of urban transport operations, particularly street-based bus services. Areas of severe traffic congestion are expanding, not only of large cities, but also of middle and small towns.

The state has totally withdrawn from its role of an owner and financier of urban transport, but still preserves a part of control over urban finances. It still decides about fare discounts for elderly, students, handicapped and some other groups and occasionally finances selected urban transport projects. In fact, the construction of Warsaw metro and rapid tramway in Poznan have so far been only such cases. There is no national agency or ministry whose scope of responsibilities includes urban public transport. The lack of the formal care of the State for urban transport has been often criticised by foreign experts and the World Bank [10]. In this situation, unprecedented in Europe, cities put some pressure on the State by placing representatives on various national commissions, or through interest groups such as the Association of Polish Cities or the Chamber of Urban Transport (IGKM), association of UPT authorities and operators.

### **Local transport policies**

Krakov was the first Polish city in which the City Council adopted long-term transport policy (in 1993). Warsaw (in 1995) and several other cities (Bialystok, Lodz, Gdynia, Wroclaw and others) followed this example adopting the strategy of sustainable development limiting the role of a car in a city and giving priority to mass transport and pedestrian and cycle traffic. The principles are very close to those recommended, for example, in ECMT/OECD projects on sustainable urban travel [1,2].

Unfortunately, implementation of sustainable transport policies in Polish cities is rather slow [5,7]. This clearly shows that adoption of an ambitious policy is not sufficient. In transitional economies, the car is assigned a high value and most users are not prepared for constraints/restrictions in its use. Consequently, policy- and decision makers are often afraid of a public reaction to radical measures such as giving priorities to trams and buses in urban traffic, traffic calming, strict enforcement of traffic rules and parking and road charging. Spectacular capital intensive road investment projects, attract more attention than more efficient but less visible

options such as maintenance and modernisation of existing UPT equipment and infrastructure and better traffic management. Financial and economic viability of competing projects is not always taken into account.

Nevertheless, great efforts have been made by cities and transport companies to stop the deterioration of urban public transport [8,9]. These efforts have been giving positive results. Under pressure of city authorities, productivity of public transport operators is growing and quality of services is improving. Operating companies are restructured with a view to improving their performance and/or reducing costs. Several cities have turned their mass transport operators into corporate organisations, to be run under Commercial Law. At present, they are still 100% owned by municipalities, but their managerial independence has been increased and they are seeking private partners and investors. It is becoming usual for municipalities to retain the regulatory function (service patterns, schedules, fares), often carried through a specialised Transport Authority, leaving operations to company management. Relations between operators and the municipalities are increasingly regulated through contracts/service agreements, based on fixed rates for agreed vehicle km of service and stringent control of performance and service quality. In many cities private operators started winning tenders for services.

Other positive facts include: (a) fleet replacement, (b) progress in fare collection systems and methods of traffic management, (d) introducing quality management in many cities; (e) good co-operation between enterprises through IGKM. But probably the most important change has been with regard to the treatment of the existing tram systems, which constitute a valuable element of transportation systems in the largest cities.

### *1.2 Tramways in Polish cities*

Tramway systems are serving 19 cities and urban agglomerations. The total length of the network is equal to 906 km (2000) and in the last decades was not changing in a significant way. Generally, since tramways were not considered as an efficient and effective transport mode, as mentioned earlier, many cities were considering switching to much more expensive metros. Great potential of the existing systems, in many cases with tracks with a private-right-of-way (75% of the network), were not realized at the beginning of the transition period. Things changed in the second half of the last decade, when several cities started considering upgrading of

existing tramway systems. Upper Silesia agglomeration (Katowice) was the first which started with a project to upgrade an existing Katowice-Bytom tramway line (20 km) to the rapid tram standard. Other cities (Krakow, Lodz, Poznan) followed and even in Warsaw, where attention is still focused on the continuing metro project, upgrading of 30 kilometers of main tramway lines is planned. Other options of low cost rail systems serving urban areas are considered as well.

### POZNAN CASE

Poznan was the first city which, at the beginning of the transition period, turned attention to tramways. With 57 km of tram lines, generally, underinvested, decision was made to build a new N-S light rail transit (LRT) line connecting one of major high density residential areas Rataje with the city center and further southern areas. Construction, partially financed from the State budget, was stopped in 1997 after completing the first 6 km. New line was linked to the existing system just at the entrance to the center. Because of financial problems and the State withdrawal, the project is not continued. Instead, rehabilitation of existing lines has been considered. New low-floor trams were ordered and the process of replacing of old fleet will continue.

### KATOWICE CASE

Case of the Upper Silesia Conurbation (Katowice) is particularly interesting. Tramway company – PKT, with total length of the network close to 207 km, serves several cities. In 1996, decision was made to upgrade the most important line Katowice-Chorzow-Bytom (21 km, 87 % of the line separated from road traffic) to a rapid tram standard. Following the feasibility study and a tender, the turnkey contract was signed in January 1998. The project includes: modernisation of 41 km of single track, power supply system, stops, delivery of low-floor trams (photo 1,2) and advanced traffic control and information system for passengers.

Unfortunately, external political factors (changes in legal status and financing rules due to administrative reforms implemented on 1 January 1999) have slowed down the implementation. Nevertheless, the project is close to completion.



Photo 1. Reconstruction of tracks in Katowice



Photo 2. Tram stop in Katowice

### WARSAW CASE

The beginning of tram transport in Warsaw dates back to 1822, when the first horse driven omnibuses started to operate on city streets. First electric tram was introduced in 1908. The most significant development took place after the World War II. Warsaw tram system became the most extensive in Poland. In 1970-ties, UPT modes carried almost 90% of motorised trips in the city. Political and economical changes at the beginning of 90-ties brought a neglect of trams considered by decision makers mainly as an old-fashioned mean of urban transportation. City's priorities in developing urban transport were mainly oriented to constructing a metro system, which started as long ago as 1982. Parallel to this an extremely high increase of private car ownership was observed (from 282 in 1990 to 430 in 2003 veh./1000 inhabitants).

In 1995, the City Council of Warsaw adopted an Urban Transport Policy document, formulated on the basis of sustainable transport idea and making use of general tendencies observed in urban areas in EU

and other OECD cities. An attention was drawn to better and more effective use of the existing transport infrastructure and to creating a balance in use of private cars and PT modes. Among other things, a favoured treatment of public transport modes in the city centre and main transport corridors was foreseen. This generally sensible orientation was confirmed both by expert recommendations and by the fact that citizens increasingly used tram services, even though very few actions were undertaken by the city to improve relatively low travel comfort. Why did passengers choose trams? Mainly because of:

- the considerable scale of the tram system in Warsaw: 120 km of tracks, almost 480 km of tram lines and more than 350 trams operating during peak hours,
- a good tram network structure, oriented to serve main transport corridors leading to the city centre;
- very high – 89% - proportion of tracks with an exclusive right-of-way, ensuring tramway transport independence from street congestion and traffic safety problems, and thereby giving enormous advantage over other ground transport in Warsaw.



Photos 4, 5. Main tram corridor – Jerozolimskie av. New partially low-floor tram and tracks with an exclusive right-of-way



Photo 3 Tram stop near Old Town. Example of tracks not separated from the streets

Increasing use of tramway system (24% of the total trips is done only using trams and 40% trips done jointly using buses and trams) and visible passengers preferences, forced city authorities to revise their attitude to the tramway system. In 2001 an improvement plan for this mode was elaborated for Warsaw. Taking into consideration the highest passenger transport volumes in tram corridors (level of 5 000 – 10 000 passengers/hour/direction), 4 main corridors representing 30% of the tram network were selected as a priority:

- three East-West corridors, crossing Vistula river: (i) Goclawek housing estate - Wiatraczna roundabout - Poniatowski bridge - Jerozolimskie av. - Banacha street; (ii) Starzynski roundabout - Gdansk bridge - Zawisza square, (iv) Wolski cemetery - Old Town - Wilenska railway station.
- one North-South corridor: Piaski housing estate - Grunwad Square - Jana Pawla II Avenue - Rakowiecka street together with Potocka housing estate - Grunwald Square branch line.

The improvement programme included:

- wider implementation of modern, low-floor trams, attracting passengers through better comfort, better aesthetics, and reliability;

*At present only 7% of trains are low-floor with higher standard. This makes comfort of tram travel low, especially for elderly and disabled passengers.*

- improvement of trams traffic organisation (lines scheme, trams frequency);

*Very complicated lines scheme in Warsaw is undesirable from the point of view of passengers (unclear system) and operator (required higher number of tram fleet, difficult co-ordination of timetables, higher operational costs).*

*Excessive tram fleet demand causes high problems with fleet renewal for the municipality which is financing trams purchasing as well as invokes higher maintenance and repair costs. This is important also because of extremely unfavourable age structure of trams. Only 30% of them are of age lower than 10 years, while more than 38% are of age higher than 20 years, with some higher than 40 years. Preliminary analysis proved that*

*existing 32 lines can be limited to approx. 15 and bound up with priority tram corridors and with 4 other corridors with three frequency standards: 3, 5 and 10 minutes for different lines. Revision of lines scheme can bring 27% savings in tram fleet demand (reduction to 260 trains in operation), resulting in substantial decrease of purchasing as well as maintenance costs.*

- improvement of trams management systems;

*Warsaw tramway system takes advantage from the convenient tracks separation from the road traffic. However this undoubtedly important virtue is not fully used. Limitations results from lack of tram priority in the traffic control system, and thereby time losses at signalised intersections. Planned improvement assumes introduction of priorities at intersections along tram corridors, through lengthening or possibly accelerating signalling green phases allowing for trams to cross. This will require modification of traffic control controllers, installation of tram detection system as well as receivers and transmitters in trams.*

- introduction of on-line passenger information system;

*Modern passenger information system will be based on existing automatic trams location*

*devices (based on GPS) used for trams security and punctuality control. Tramways upgrading program assumes that passengers waiting at stops and terminals will receive on-line information (audio and visual), concerning expected tram arrival times, possible delays and emergency situations.*

- improvement of tramway infrastructure (standard of stops, tracks, power supply system);

*Technical condition of infrastructure is diverse. Very small financial resources spent on tram infrastructure maintenance in 90-ties resulted in maintenance backlogs. Fortunately main tram corridors were maintained better than others, thus their technical state isn't conditioning improvement of passengers travel comfort. For example on the highest priority corridor along Jerozolimskie av., 50% of sections were repaired within last 5 years, and 70% of sections are not older than 10 years. Furthermore, a programme of power supply system improvements is being implemented. It will increase system reliability and decrease the energy consumption.*

The size of the planned upgrade of the tramway system was adjusted to the limited financial resources being in disposal of the municipality. Hence infrastructure costs were minimised, giving priority to all tasks directly improving passenger transport standards (tram fleet, stops, passage control at intersections). It is envisaged that implementation of the project will allow to maintain dominant role of PT in transport (approx. 64% of trips in peak hour). For passengers, proposed changes will improve: tramway system efficiency (punctuality, reliability), travel comfort (better trams and tracks), comfort while at stops (shelters better equipped), ease of boarding/alighting (tram floor and stops platform at the same level), and quality of the information system.

The total budget (without the cost of buying trams) necessary for project implementation is estimated at the low level of EURO 18 million (0.6 million /km). The implementation schedule assumes project completion within 48 months, i.e. one tram corridor improvement per year. However, the success of the programme strongly depends on two conditions:

- the commitment of city authorities to program implementation (mainly in introduction of PT priorities, sometimes against privileges of cars);
- the allocation of additional resources for tram fleet replacement.

## WROCLAW AND KRAKOW CASES

Wroclaw and Krakow have long tram history. Wroclaw was the first city (within today's Polish borders) with electric trams (1893), and Krakow one of the first (1901). At present tram systems in both cities are well developed, although substantial parts were designed more than 50 years ago. Hence, especially large segments of the network are not separated from the car traffic. In this regard, the situation outside city centres is much better.

Table 1. Basic Wroclaw and Krakow tramway system characteristics

	Wroclaw	Krakow
Network length	89 km	83 km
Number of lines	33*	23
Lines length	363 km	286 km
Trains operating in peak hour	205	180
Tram wagons in inventory	419	434
Number of train-km per year	17,8 mln	22,8 mln

\* including 10 night lines

The specificity of these two cities (significant number of kilometres of tracks without an exclusive right-of-way), causes that tramway systems suffer from traffic congestion. This results in a very low average tram speed (13.4 km/h in Wroclaw, 14.5 km/h in Krakow) and high tram fleet demands. In Krakow, a certain breakthrough in this situation happened due to the positive effects of the changes in traffic organisation connected with a temporary closure of one of the main bridges over Vistula river - Debnicki bridge. To counteract foreseen traffic difficulties, an exclusive right-of-way for trams and buses was established along Trzech Wieszczo w av. In a short time it was observed that movement of PT vehicles was very efficient (much more than before changes) and competitive with relation to cars. Furthermore, in this corridor 30% increase of the number of tram and bus passengers was recorded.

These results, as well as visibly strong public acceptance, caused that after the end of bridge repair, 1100 m of integrated exclusive right-of-way for trams and buses was formed and became a permanent element of the avenue. Afterwards Krakow began implementation of the bus and tram lanes integration program. Similar actions were started in Wroclaw, both aiming to:

- separate bus-tram corridors from the street with car traffic, often at the cost of car lanes,
- better use tramway corridors (together by buses and trams),

- improve transfers of passengers between trams and buses (exchange at the same stops),
- improve transport effectiveness - no competition between trams and buses in the same corridor.

Promising results from Krakow and Wroclaw are encouraging other cities to follow this solution. Similar program of more effective utilisation of tramway corridors is prepared for Warsaw, including 5 integrated bus tram lanes and 3 stops (altogether 9,5 km of tracks).



Photo 6. Krakow, Grunwald Roundabout. Integrated bus-tram stop.



Photo 7. Krakow. Bus exit from the integrated bus-tram lane

## CONCLUSIONS – PERSPECTIVES AND THREATS

The future of urban public transport and, in particular tramways, in Poland is not clear. On the one hand, there is growing understanding that even with the high car ownership rates cities cannot

function without an efficient and attractive public transport. On the other hand, there is a very strong pressure to develop new roads and opposition of some groups against allocating city financial resources to public transport investment and

operation and giving priorities for trams and buses in traffic management.

This does not take into account preferences of the city inhabitants. For example, in Warsaw, in two recent travel O&D surveys [11] the subjects were asked "what is your opinion about giving priority to trams and buses in traffic management even if this will reduce capacity of urban roads left for other vehicles?". In 1993, 64 per cent of respondents said YES and, in 1998 this number grew to 66 per cent. Almost the same opinion was expressed by car owners (59 and 61 per cent). It was astonishing that support for public transport has been increasing in the period of a very rapid motorization.

Even in this difficult situation then, there are reasons for some optimism. Readiness of city councils to adopt sustainable transport policies has already been mentioned. Other reasons include ongoing processes of:

- the development of capacities of the city governments to manage public transport matters in a more efficient way (transport authorities, tendering, contract, quality requirements etc.);
- restructuring of companies, increasing their efficiency and competitiveness in new circumstances;
- fleet renewal leading to a growing share of modern trams, buses and trolleybuses.

In cities served by tram systems there are great opportunities to use their potentials. This still require a lot of efforts given long-held anti-tram prejudices. Fortunately, the threatened removal of tram tracks has not happened and in the growing number of cities attitude is changing. Renaissance of tramways in several EU cities serves as a good example for planners and decision-makers. However, it will take time before this chance is fully used.

Among threats and barriers for the future of the urban public transport, the assistance of State (parliament, central government) is a crucial matter. As it was stressed earlier, the State has stopped its assistance for local transport at the beginning of the transition period.

The problem of the financing system of urban transport is still a burning question. The level of urban transport self-financing achieved in Poland is considerably higher than in European Union countries and in the neighbouring Central European [6]. In the first period of transition, the cost coverage from the farebox in the largest cities increased radically from 35-45 % in 1988 to 45-80 % in 1992. From 1995 the average cost coverage has been

decreasing - from 68,3% in 1996 to 62% in 2002. As it was mentioned earlier, the increase was achieved by raising ticket prices and improving performance of companies, but also at expense of irrational savings in the field of fleet and infrastructure maintenance (it concerns especially tram systems), and giving up modernisation and expansion investments. Difficult economic situation in urban transport sector is demonstrated also by the small share of the private sector, including foreign operators, as in the present situation urban transport investments are risky and not attractive enough.

As it was said before, perspectives of urban public transport in Poland are not clear. At the beginning of transition period, these modes were used by large majority of urban inhabitants. Since then, rapid growth of motorization and the reduction of financial support from the public budget have caused that their role was somewhat reduced. Then, because of increasing congestion and growing understanding that public transport is needed not only for non-motorized groups of the population, the situation has changed. Great efforts of transport organizers and service providers (operators) has brought visible improvements of quality and productivity. If new trend to rehabilitate tram systems will continue, it can bring about significant progress in solving urban transport problems.

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