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IMPROVEMENT OF TRANSPORT SYSTEM FUNCTIONALITY AND INTEGRATION OF PUBLIC TRANSPORT IN THE POZNAŃ AGGLOMERATION*

Introduction

Work on the integration of public transport systems in Poznań and in the surrounding municipalities was first initiated in 2006 as the City of Poznań commissioned CEG Sp. z o.o. with its registered office in Poznań with a task to draw up a study specifying the possibilities of organising mass transport within the agglomeration. At the beginning of 2007, experts of CEG prepared a document including the characteristics of a few dozen or so options along with their recommendations. The selected model assumed the development of an inter-municipal union, with the key role played by an organiser and regulator of the local transport market which holds various competences, is a public entity and allows operators of different ownership structure to provide transport services. The model received political approval. In the course of further actions, the Council of Poznań Agglomeration was established, which aims at the integration of various functions provided by Poznań and particular municipalities, including also the public transport. A very important stage on the road to the full integration of public transport was the establishment of Zarząd Transportu Miejskiego (ZTM – Urban Transport Authority), an organiser and regulator of public transport, on October 1st 2008. After two years, on November 9th 2010, in line with the act adopted by the City Councils of Poznań and Luboń, based

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on the existing ZTM, Związek Międzygminny "Transport Aglomeracji Poznańskiej"[1] (ZM "TAP" – Inter-municipal Union "Poznań Agglomeration Transport") was set up. The aim of the Union is to fulfil the own tasks of the city and municipalities as regards local mass transport services, modernise and develop the existing transport system as well as unify local mass transport services and accelerate the process of integration of municipal transport systems. The tasks so far performed by ZTM and particular municipalities such as: route planning, timetable composition, ticket sale, propagation of passenger information, are to be taken over by the Union[2].

As a result, it can be acknowledged that the task of establishing a municipal public transport union with the municipalities from the metropolitan area has been fulfilled – as of October 1st 2011, all urban transport lines in Luboń and selected lines serviced by ZUK Komorniki were merged into one coherent urban transport system. This means that a unified line numbering and, what is most important, a unified ticket tariff (one ticket) have been applied to the above lines. The task, however, has been fulfilled only to a limited extent, as the remaining 9 municipalities surrounding Poznań still have their own local transport systems[3]. Hence, it is necessary to take further actions to extend the operations of the Union, mainly increasing the share of the public transport in the transport tasks within the metropolitan area.

Lack of a railway transport provider, the key operations of which would be the provision of agglomeration transport services, has led to the participation of the Marshal Office of the Wielkopolska Region in the work on prospective concept for passenger railway transport system in the region. The Wielkopolska authority unit became the organiser of regional transport services by force of the resolution on taking over regional transport services (at that time performed by Przewozy Regionalne company) adopted by the regional assembly (sejmik województwa) on September 28th 2009. The following characteristics were estimated and described: passenger streams on transport routes to the agglomeration, indispensable number of train pairs a day, location of new railway stops in the agglomeration and in Poznań[4]. The agglomeration railway transport system is to form a framework for the mass transport system operating as agglomeration transport system and urban transport system for the citizens living in the outskirts of the city. Trains on the remaining lines could provide

[1] A similar resolution was adopted by the councilors of the Dopiewo municipality on 28.02.2011.
[2] www.ztm.poznan.pl/integracja/zmtap (20.12.2010).
[3] The so-far conducted actions contributed to the ordering of bus numbers and introduction of zone tickets on a small area as only few municipalities signed relevant inter-municipal agreements with the city of Poznań.
[4] R. Jałoszyński: *Więcej dobrych pociągów do stolicy regionu*. "Monitor Wielkopolski" 2010, No. 9, p. 8-9.

intermediate transport services to passengers living in towns and villages located in some distance from the city with no direct connections to the city. Initially, Koleje Wielkopolskie was to start its railway operations in December 2010. It was, however, impossible as the company obtained the safety certificate (required to provide passenger transport services) only on 17.03.2011[5]. The start-up of business operations of the company took place on 1.06.2011 at 4:40am on the route Wolsztyn-Leszno. The scope of transport operations provided by Koleje Wielkopolskie is not impressive, however, as trains operate only on 3 lines connecting Zbąszynek with Leszno, Leszno with Jarocin and Leszno with Ostrów Wielkopolski.

A study conducted by R. Bul in March 2011 shows that on working days at early daytime hours (5:00am – 8:00am – trains and buses, 5:30am – 8:30am – personal cars) over 60k people travel from the surrounding municipalities to Poznań. The majority of them travel by car (ca. 52k people, 40k vehicles), 9k people travel by trains and only a few hundred of them take PKS buses (mainly from the direction of Śrem and Pniewy). According to the study, most travellers got off at the Poznań Główny station (over 7.5k passengers), with nearly 4k passengers arriving from the south (travellers from Leszno, Wolsztyn, Jarocin and Zbąszynek) and 3.5k passengers from the north (travellers from Szamotuły, Oborniki Wielkopolskie, Wągrowiec, Gniezno and Września). Such stops as Poznań Garbary, Poznań Wschód and Poznań Dębiec are also important transport nodes.

As regards the road transport, the largest stream of passengers was observed on the national road no. 92 from the west (from the Tarnowo Podgórne municipality) – almost 3k vehicles, the national road no. 5 from the south (from the Komorniki municipality) – over 2.5k of vehicles and on road S-11 from the south (from the Kórnik municipality) – also over 2.5k of vehicles. These are the directions without railway lines (at least partially) which may be the reason for a more intense use of individual transport. It turns out, however, that a significant volume of personal cars is observed also from the directions serviced by the railway transport system i.e. Gniezno, Swarzędz, Mosina, Luboń and Oborniki Wielkopolskie. It means that the agglomeration railway transport system has a large potential – it only needs to be managed in a proper manner to develop a high quality offer, which would encourage people travelling by cars to change the means of transport.

[5] The company received the A part of the certificate approved by the president of UTK already on 3.03.2011.

Necessary actions – characteristics

The key task aimed at increasing the share of public transport in the passenger stream service is to develop an attractive agglomeration railway transport network. The authors of this study support the proposals prepared by the Marshal Office of the Wielkopolska Region, whereby agglomeration trains were to travel on five routes (fig. 1).

Trains proposed on the above lines are to travel frequently and, what is important, at fixed intervals: on urban routes – even 4 times per hour, on the main routes connecting Poznań with particular municipalities surrounding Poznań – 2-4 times per hour, i.e. every 15-, 20-, 30- or 60-minutes.

Table 1

Agglomeration railway transport system routes

Line no.	Route	Traction and max. speed (km/h)
S1	(Gniezno) – Pobiedziska – Poznań Wschód – Poznań Główny – Luboń – Czempiń – (Kościan)	electrical, 160
S2	(Września) – Kostrzyn – Swarzędz – Poznań Wschód – Poznań Główny – Poznań Górczyn – Opalenica – (Nowy Tomyśl)	electrical, 160
S3	(Wągrowiec) – Murowana Goślina – Poznań Wschód – Luboń – Stęszew – (Grodzisk Wielkopolski)	diesel engine-powered, 120
S4	(Wronki) – Szamotuły – Rokietnica – Poznań Jeżyce – Poznań Główny – Poznań Starołęka – Środa Wielkopolska (Jarocin)	electrical, 120 i 160
S5	(Rogoźno) – Oborniki Wielkopolskie – Poznań Jeżyce – Poznań Główny	electrical, 120

Stops which agglomeration trains are to reach less often are specified in brackets.

Source: Marshal Office of the Wielkopolska Region in Poznań.

It is necessary to coordinate timetables of particular lines properly, so that the waiting period for another train is as short as possible. Some of the existing train stops/stations need redevelopment to become actual multimodal transport nodes. In the first place, the following stops/stations should be redeveloped:

- Poznań Dębiec,
- Poznań Górczyn,
- Poznań Junikowo,
- Poznań Starołęka,
- Poznań Wschód.

It is also important to ensure good quality passenger information, i.e. provide information about a particular line and line structure on the trains as well as at all stops and stations. The information must be updated on a regular basis also during planned renovation works as well as in unexpected events, such as breakdowns, accidents, etc. The staff of Koleje Wielkopolskie has to be properly trained so as to provide passengers with assistance, support and information at all times.

Travel comfort and safety as well as safety at stops and stations are of equal significance. As regards the former, proper investments have already been made by the Marshal Office of the Wielkopolska Region. On 8.02.2011, a contract for the delivery of twenty-two 4-module electric multiple units ELF was signed with PESA from Bydgoszcz (contract value: almost PLN 470m[6]. New, comfortable and fast rolling stock (max. speed: 160 km/h), which is less likely to break down, will enhance the reliability of planned timetables, decrease the number of train sets held as rolling stock reserve and diminish the costs of rolling stock maintenance and its renovation.

Apart from purchasing the rolling, it is also important to modernise railway stops and stations, improve their accessibility and construct P&R (*park & ride*) and B&R (*bike & ride*) parking lots as well as K&R (*kiss & ride*) drop-off zones. It will also be important to increase the number of performed functions to attract more and more passengers. Investors are to be sturdily encouraged to build commercial and retail centres in the vicinity of railway stations. To reach this goal, endeavours are to be taken aimed at the takeover of railway stops and stations by local authority units. Local authority units are to be responsible for shaping the spatial development policy, so that new higher density housing estates are constructed in the surroundings of railway stops and stations (max. within 1 km radius) as well as for taking care of the housing estate planning to ensure safe access to railway stops and stations for both pedestrians and cyclists.

New railway stops and stations are to be constructed, which will make railway transport system more accessible to the largest possible number of people, both in Poznań and in the municipalities within the borders of the Poznań poviat. Investments should be carried out in the following locations:

- Poznań Jeżyce,
- Poznań Golęcin,
- Poznań Podolany,
- Poznań Wilda,

[6] www.umww.pl/urzad/aktualnosci/umowa-na-22-nowe-pociagi-dla-wielkopolski-podpisana.html (27.10.2011).

– Poznań Zawady,
– Poznań Miłostowo
– Poznań Zegrze,
– Poznań Naramowicka
– Poznań Uniwersytet

as well as numerous stops located on the lines within the agglomeration located at the biggest existing and planned housing estate.

For the first time the operations of the agglomeration railway transport system will be supposedly tested in December 2011 when along with the release of a new timetable (although works are to be fully completed in 2013) trains operating on the routes Murowana Goślina – Grodzisk Wielkopolski or Wolsztyn (line S3)[7] will appear on modernised lines 356 and 357 and will start operating more frequently than currently. Decision makers have to remember not to be discouraged by only small successes at the beginning – evident effects of scale will be visible only when the entire agglomeration railway transport system enters into operation. At the same time, in order to integrate the entire public transport in the agglomeration it is necessary to conduct a string of actions in the public transport area both in Poznań and in the surrounding municipalities.

The success of the public transport system integration process will be measured by the number of municipalities within the borders of the Poznań metropolitan area operating as part of ZM "TAP". At first, it is important to attract municipalities generating the largest passenger streams commuting every day to Poznań, i.e. municipalities of the so-called primary transportation ring (directly bordering with Poznań). It is also important not to limit transport services to buses only, but ultimately include also local railway transport services. Związek Międzygminny should also include PKS Poznań, the fleet and potential of which can be used, apart from the existing transport services, to provide transport services to and from railway stops and stations. Such integration of transport services combined with proper arrangement of timetables (bus timetables as complimentary to agglomeration train timetables) would translate into significant positive effects of scale both for passengers and transport system operators cumulating passenger streams and offering them fast and efficient transport services.

To achieve success, it is necessary to implement promotional and educational actions presenting benefits of the integrated public transport system as part of ZM "TAP". The actions should be addressed at both local authority units and citizens. The citizens should be educated in terms of the actual costs of travelling by car, i.e. individual costs (all costs, not only costs of fuel) and external costs

[7] Only initially as ultimately S3 line is to connect Wągrowiec with Grodzisk Wielkopolski.

(social and environmental) known only to a limited group of people, as it impacts daily transport-related decisions. Broadening the knowledge and increasing awareness among the citizens combined with preparing an attractive transport offer would increase the demand for public transport services.

Apart from organisational and promotional & marketing actions, the integration process will also require developing new infrastructure and modernising the old one. The priority for the authorities of Poznań, in line with the intention expressed for many years to ensure sustainable transport development, should be increasing the access to tram transport network. In the densely populated area of medium-sized cities it is the tram that proves highly efficient and competes effectively with individual car transport, contributes to the development of the city and becomes its symbol (as in the case of many French cities).

Until 2020, the currently conducted investments are to be completed (extension of PST (Poznań fast tram) along with the construction of a tram terminus at Dworzec Zachodni (Railway Station West) and construction of a tram route to Franowo along with a tram depot) and the tram transport network in Poznań is to be extended by the following stretches[8] and some infrastructure elements:

- Route to Naramowice district along Garbary street, Szelągowska street and Naramowicka street and its connection with the tram terminus in Wilczak district. The route is to enable the fastest connection between the city centre and Naramowice district which is developing intensively (ca. 6.5 km).
- Extension of the tram route from the tram terminus in Ogrody district in J.H. Dąbrowskiego street to Polska avenue along Nowina street (ca. 1 km) and construction of a new bus and tram station at Polska street and J.H. Dąbrowskiego street.
- Route along F. Ratajczaka street, C. Ratajskiego square and F. Nowowiejskiego street to the junction of K. Pułaskiego street and Wielkopolska avenue (ca. 1.7 km).
- Extension of a tram line from the tram terminus in Zawady to Poznań-Wschód railway station (ca. 1 km) and construction of an interchange station at that place.

In the years 2020-2030 the following tram routes are to be constructed:

- from the tram terminus in Górczyn district along Albańska street, Pogodna street, Grochowska street and Szpitalna street to the tram terminus in Ogrody district;

[8] The order of investments results from the scale of benefits which, according to the authors, they can result in.

– extension of a tram route from the tram terminus in Dębiec district along 28 Czerwca 1956 street to the planned tram terminus at Dębina housing estate;
– extension of the PST (Poznań fast tram) from the tram terminus at Sobieskiego housing estate to Morasko district, which develops intensively.

It is also vital to develop a network of P&R and B&R parking lots at the main tram termini, in particular:

– in Franowo district – currently in construction,
– at Jana III Sobieskiego housing estate, and if PST tram route is extended – at the tram terminus in Morasko district,
– at planned tram terminus at the junction of Polska avenue and J.H. Dąbrowskiego street,
– in Miłostowo district in Warszawska street,
– in Starołęcka street,
– in Naramowicka street at the end of the planned tram route.

Bus transport system will be complimentary to the tram transport system. To improve its currently dysfunctional operations due to congestion issues, in particular during rush hours, dedicated lanes – the so-called bus lanes – will have to be separated or tram & bus lanes will have to be constructed. The latter solution is to be implemented in 2012 along W. Reymonta street and S. Przybyszewskiego street. The existing tram route will be redeveloped and adjusted to bus transport; tram&bus stops will be constructed. Further plans envisage gradual extension of the above route from J. Nowaka-Jeziorańskiego roundabout to J.H. Dąbrowskiego street and construction of a similar route along J.H. Dąbrowskiego street. The authors of this study are of the opinion that such a solution would prove favourable for all traffic participants, yet the effects of tram & bus lanes operation will have to be scrutinised, so that the solution becomes a benchmark for the next stages of such an investment, e.g. on the stretch from Śródka roundabout to Rataje roundabout. Constructing tram & bus lanes is to be accompanied by the development of traditional bus lanes. The biggest problem related to the development of bus lanes is connected with limited number of two-way roads with two or three lanes. Despite the abovementioned difficulties and surely vigorous protests of the remaining infrastructure users opposing limited capacity, the solution is to be implemented in the following locations:

– in J.H. Dąbrowskiego street in the stretch leading to the planned bus & tram station in Polska avenue,
– in Bukowska street from Roosevelta street to Polska avenue and from the airport to Roosevelta street,

- in B. Krzywoustego street in the stretch to Rataje roundabout,
- in A. Baraniaka street in the stretch to Jana Pawła II street,
- majority of streets serviced by buses within the primary transportation ring, in particular along the entire Solna street, Garbary street and Niepodległości avenue.

Similarly as in the case of trams, buses should also have the right of way at junctions before other road users. The tool increasing the attractiveness of bus transport, especially in the outskirts of towns with dispersed developments, will be the so-called "flexible lines" transporting passengers to the nearest tram termini or interchange bus stops and nearest railway stations (within the borders of poviat). In the opinion of the authors of this study, areas to be potentially serviced by the "flexible lines" are to include Smochowice, Strzeszyn, Spławie, Szczepankowo, Krzesiny, Marlewo, Głuszyna, Piotrowo and Sypniewo.

Providing transport services in the areas with dispersed developments requires the use of mini- and midi-buses. Introducing the mini- and midi-buses would improve the access to urban public transport in the outskirts of the city as well as in particular peripheral municipalities, the citizens of which would have a choice and could use other transport means rather than just being forced to use individual road transport.

The management board of ZM "TAP" should be open to demands reported by citizens as regards the development of new lines, modification of the existing ones, introduction of the "flexible lines" or change of timetables. The effects of introduced changes and the existing solutions should be monitored on an on-going basis to eliminate the least effective solutions and at the same time to adjust supply to demand through tailoring the frequency of transport services and their capacity.

The introduction of the Poznań Electronic Agglomeration Card (Poznańska Elektroniczna Karta Aglomeracyjna – PEKA) will support, as a quasi bottom-up initiative, the integration of transport in the metropolitan area and its growing popularity will become one of the drivers accelerating the process. PEKA is not only useful and comfortable for the agglomeration citizens using public transport system as it has potentially numerous functions but also for the transport system operators as it allows them to make detailed calculations and will become a perfect tool for measuring passenger streams.

Integration actions have to include the unification of the passenger information system (which has been partially delivered by means of introducing unified line numbering), coordination of particular timetables, especially in key agglomeration transport nodes, as well as coordination of transport routes serviced by various transport operators.

The planned initiative of creating a 30km/h restricted speed zone ("Tempo 30") is to cover the city centre area between Niepodległości avenue, Święty Marcin street, Solna street and K. Marcinkowskiego avenue. The plans include the introduction of cycling contra-lanes, among others, in T. Kościuszki street, F. Nowowiejskiego street or 27 Grudnia street, as well as engineering elements and small architecture elements, which are to prevent drivers from exceeding the permissible speed of 30 km/h.

Although many individual drivers are against the establishment of the restricted speed zone "Tempo 30" and are in general against reducing the maximum speed limit, they tend to forget that during rush hours the average speed in the centre of Poznań and even in many streets outside the city centre oscillates around a dozen or so kilometres per hour, while at times in-between the rush hours it is only slightly higher. Paradoxically, as evidenced in multiple Scandinavian or German cities where such solutions have been applied for years, the maximum speed limit of 30 km/h not only contributes to increased safety of pedestrians and cyclists (and drivers themselves), but also increases the average speed of vehicles even up to 25 km/h (owing to smoother traffic flow). The solution will also reduce the level of noise and vibrations. A smaller number of cars in the zone and attractive small architecture elements should encourage people to strolling and contribute to the revitalisation of the entire area. Similarly as in the case of the shared bus&tram lanes, the restricted speed zone "Tempo 30" is also a pilot project and its successful implementation, good quality and satisfactory effects can convince the citizens to such projects and thus trigger the establishment of further similar zones. The authors of the study have no doubts that such zones should be created, in particular in the Jeżyce district (between the following streets: S. Przybyszewskiego, J.H. Dąbrowskiego, F. Roosevelta and Bukowska), Łazarz district (between the following streets: Głogowska, Hetmańska and Kolejowa) and in Wilda district.

Conclusion

The integration of particular systems and increased functionality of public transport following many years of divisions, negligence and chronic under--financing combined with dynamic increase of personal vehicle traffic is a very demanding task, yet it needs to be taken. The strongest driver towards further integration of public transport system in Poznań and peripheral municipalities will be positive experiences and benefits for transport users and operators in Poznań and Luboń. Their example will prove stimulating, if not directly for local politicians, then certainly for citizens who will force the politicians representing them to accede to the integration process.

Paradoxically, the factors favourable to the development of the public transport will also include the increasing level of transport congestion, growing fuel prices on global markets as well as higher excise duty – PLN 0.15 per litre of diesel fuel as of 1.01.2012. The costs of personal car use will go up and it will be accompanied by more and more intensive actions taken by the European Commission aimed at the reduction of external transport costs by means of introducing the principles ”polluter pays” and ”user pays”. Therefore, some drivers will resign from travelling by car, because they will not be able to afford that or they will come to a conclusion that they spend too much time in traffic jams and will choose alternative means of transport.

Environmental awareness supported by relevant informational and educational campaigns (including also transport education classes at schools) should trigger a change in the transport-related behaviour and contribute to a greater demand for mass transport services, popularity of travelling by bikes and to rationalisation of car use, e.g. through *car-sharing* and *car-pooling*.

The implementation of a plethora of actions aiming at restricting car traffic in Poznań, especially within the secondary transportation ring, will have a great impact on the successful delivery of the plan aimed at increasing the share of public transport services. The key action should cover the implementation of a comprehensive parking policy in the city with the following main elements: extension of the existing Paid Parking Zone (Strefa Płatnego Parkowania – SPP); higher parking charges, introduction of parking charges within SPP also on Saturdays; construction of parking lots in the *park & ride* formula; construction of multi-storey parking lots which would contribute to the liquidation of parking places along the streets, stopping the establishment of illegal parking lots; implementation of intelligent transport systems informing about the location of parking lots and number of vacant parking places[9]. The above actions should be accompanied by marking special places for vehicles providing deliveries to business entities and institutions located within the SPP zone[10]. These places are to ensure safe and smooth loading of goods and should not interrupt other road users and pedestrians. Above all, deliveries and waste collection are to be conducted outside rush hours. These rules should also apply to vehicles owned by courier and post companies. In the longer time horizon (after 2020), provided the above actions do not bring the assumed effects, the possibility of introducing congestion charges for vehicles entering the centre of Poznań, as in Stockholm or London should also be considered.

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[9] H. Igliński, *Polityka parkingowa a ograniczanie kongestii transportowej w miastach*. „LOGISTYKA” 2010, No. 5, p. 21-23.

[10] The need is proved by research results. See: M. Szymczak: *Solving Road Cargo Traffic Problems in Cities – A Logistics Approach*. In: *Zarządzanie projektami logistycznymi*. Ed. by J. Witkowski, A. Skowrońska. “Prace Naukowe” No. 11, Uniwersytet Ekonomiczny we Wrocławiu, Wrocław 2008, p. 199-208.

The majority of the proposed actions would translate into transferring capital expenditure from road transport to mass and bicycle transport, which combined with the implementation of a number of actions characterised by different persuasion power will result in a natural resistance on the part of car users. Protests of drivers reluctant to the change in the existing policy focused mainly on the development and modernisation of road infrastructure may discourage local authority units, in particular the authorities of Poznań, from determined delivery of the assumptions specified in the *Development Strategy for the City of Poznań by 2030* for fear of not being re-elected. Such fears are justified – therefore, introducing informational and educational programmes and the dedication of the authorities are crucial. Withdrawal from the policy of sustained development will result in a further decrease in the population of Poznań, higher congestion and relevant costs, intensification of transport problems and many more.

The barrier in the integration of public transport and investments carried out to improve its operations could also be hardships in reaching an agreement between local authority units at different levels. The most important issue and at the same time the most difficult one is the share in financing of particular investment plans as well as a division of costs related to the maintenance and operation of a given infrastructure element. Hardships may also occur when specifying the schedule of implementing actions and delivering investments due to the fact that their significance is different for every municipality.

The biggest obstacle in the execution of the tasks described in this paper will be funds. It will be even more difficult to obtain the funds as the European Union subsidies will be certainly much lower than presently, the city of Poznań is already deeply in debt and the tax base is diminishing due to gradual outflow of citizens from the city.

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