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The significance of internal integration of public transport for improving offer

1. Introduction

After long years of negligence, public transport (PT) has again become a topic of discussion and debates in transport planning circles in Slovenia. Unfortunately activities have so far been limited to strategic considerations and research, real activities for improving offer and increasing usage of this transport system are few and even these are disconnected and contribute little to improving general performance of the whole PT system. The article presents findings of an attempt at comprehensive dealing with PT, which was carried out by the research »Development possibilities of PT and settlements in the Republic of Slovenia« (Lep, Plevnik 2003) [1]. The research goal was to define and integral PT and settlements development concept, while its purpose was to obtain expert backing for the preparation of a strategic development document concerning PT in Slovenia.

Despite the common approach to dealing with transport and settlement systems, during the course of the research we established that such a dedicated approach when dealing with PT in Slovenia is impossible. The first reason is unbalanced strategic questioning of transport and settlement systems. While the vision for the national settlement system on the national and lower levels is strategically well structured and supported by recent research and strategic documents (e.g. Strategy of physical development of Slovenia), similar integral research in the field of transport unfortunately still hasn't been done. Concerning PT, the condition is even worse, whereby this research was in fact in many ways a pioneer undertaking. That is why we decided to focus our research precisely on the development of PT, since it was severely neglected in the past, both concerning the transport system as well as in connection to settlement. Another additional reason for emphasised dealing with PT in the project was the understanding that this transport subsystem, because of its underdeveloped condition, is becoming a marginal part of the transport system, which also corresponds to its minor influence on settlement.

Our review of the state of PT in Slovenia showed that its wider social role wasn't defined. Slovenia runs and manages its transport system without a comprehensive vision or strategic document in this field, thus operation of this profoundly important sector is rapidly moving away from comprehensive, strategic and long-term thinking and acting. Just as the whole transport system, even the PT sub-system doesn't have a comprehensive vision of development, which is causing competitive struggle instead of complementarities of the sub-systems (bus and railway) and between operators at various levels of territorial offer, thus additionally weakening competitiveness of the whole PT offer.

Furthermore, poor quality offer and unjustifiable competition by other sub-systems is causing the share of PT in general transport to diminish. Instead of balancing shares between particular transport sub-systems the state has largely transferred development of management of PT to local communities and market conditions, which are generally incapable of maintaining and managing the system on an adequate level. An important issue in Slovene PT is also inadequate functioning or even non-existence of basic elements for managing mobility, i.e. information, communication, organisation, coordination and promotion.

Because of the deficiency of suitable domestic development documents we analysed recent transport and physical planning documents of the EU and member states, as well as new European research dealing with PT (MARETOPE, ISOTOPE, VOYAGER). The reviewed documents were the basis for defining the criteria apparatus for analysing the condition and defining issues in the Slovene PT system. Based on the results of introductory analyses we defined the starting points and goals, as well as the PT concept itself. During definition of strategic PT goals we discovered that contemporary transport policies at various territorial levels specially emphasise the significance of strengthened PT in the transport system, as well as improving its offer as an alternative to private car transport. Integration is of key importance for meeting the system's potentials, which should contribute to the offer's increase in attractiveness and utility. Definition of integration of PT and its significance for development of the system is in fact the theme of this article.

2. The significance of integration

In the Slovene dictionary the term integration is defined as »connecting particular units, parts into a larger entity« (DZS, 1995). The term is often used in modern transport planning, especially in conjunction with integrated approaches to transport systems, in the sense of integral transport policies, integration of particular transport modes into unified systems etc. The scope of the used term in Great Britain is illustrated by ways of integrating urban transport policies, as prophesised by the Department of transport:
Integration of decision making institutions;
- Integration of measures for various types of transport;
- Integration of measures for financing and managing infrastructure;
- Integration of measures in transport and urban planning policies (May, 1993: 2).

Even the new transport policy in Great Britain solves transport issues by:
- Integration within particular transport sub-systems and between them, thus enabling each sub-system to contribute all its potential to the operation of the whole system and allow users easy transfers from one sub-system to another;
- Integration with the environment – the transport system should contribute to a better environment;
- Integration with physical planning on all levels – physical and transport planning should work together and ensure more sustainable modes of voyages but also diminish the need for voyages;
- Integration with education, health and social policies, whereby the transport system could contribute to an equitable and just society (DETR 1998).

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3. Internal integration of public transport

During our review of foreign practises we discovered various types of integration even in the field of PT. They can be joined in two general groups:
- External integration – includes integration of PT as a singular system to other systems, most often settlement and environment (dealt with in settlement and environment strategies), but also other sub-systems within the transport system (dealt with by transport policies); the essence of external integration is defined in the before stated examples from Great Britain);
- Internal integration – is of key importance for maximising the PT system's potential, since it contributes the system with increase to a higher level of attractiveness and utility and thus an increase in market share. This is surely one of the weakest elements of competitiveness of existing PT systems when compared to private car use. Internal integration implies linkages between various PT services into a unified system, which enables application of the »door-to-door« concept.

The article presents a more detailed account of the second system. Internal integration is dealt with from the aspect of defining and controlling the system's quality and as an element in conceptualising the PT network. The ISOTOPE project defined three elements of integration, which we applied to our project, namely:
- Physical,
- Pricing
- Logical (ISOTOPE 2000).

3.1 Physical elements of internal integration

Physical aspects of internal integration apply to the PT network concept, transfer points and schedules. Together these three elements form an integrated service in the physical sense, which can be conducted in one or more transport modes (bus, train, tram etc.). The main goal of physical integration when concerning particular transport modes is to ensure good access to the system itself and good transferability within the system when direct connections cannot be provided. Therefore physical integration also involves ensured safe and user-friendly transfer points and provided transfers.[2]

Transfer points and connections between different transport modes enhance attractiveness of PT for users. Simultaneously such connections ensure better adaptability of providers and planners of public transport. An adequately devised transfer point, which is well managed and works perfectly, can diminish time loss during transfers within one transport mode or to another. Similarly time spent while waiting for a vehicle can be shortened, leading to shorter voyage times. The mentioned reasons point out the importance of transfer points in the PT network and significance of knowledge about all elements and factors that contribute to its operation.

In PT systems with various transport modes physical integration strives for the establishment of such a system, in which each transport mode can maximise its advantages within the system. A typical example of integration is between railway and bus networks, whereby the railway feeds the main flow of passengers and the bus system covers sparsely populated areas, where there is less passenger demand. In such a concept direct bus routes to urban centres are transformed into feeder lines for the railway network, which takes aboard the main flow of passengers to the city centre. This implies additional transfers for passengers, but can be justified with higher speeds and reliability of the railway.

The introduction of improvements and achievement of integration are affected by numerous elements, such as travel speeds and voyage times on particular transport modes, quality of transfers, access to the railway network in the target area etc. In general transfers between transport modes is beneficial for the passenger when the following conditions occur:
- Good railway connections (frequent and quick connections and good access to city centres),
- Well placed transfer nodes,
- Harmonised schedules,
- Congestion on the road network,
- Larger distances between transfer points and voyage destinations,
- Concentration of activities and voyage destinations in city centres (near railway stations) and along high capacity PT corridors.

In practise there are many physical integration models with numerous transport modes. The main types are:
- Consistent feeder model without redundancy of services or routes;
- Strict feeder model, which is expanded with parallel direct connections in more burdened corridors during rush hours;
- The model, which maintains a limited quantity of parallel connections, thus improving access to city centres;
- The model, which establishes competition between direct and parallel programmes.

The introduction of consistent feeder models can be supported by reasons of cost efficiency. Especially in cases where the railway has free capacities the consistent feeder model is being applied, aligned to principles of protecting and efficient use of infrastructure. However, we have to be aware of practical experiences, whereby many passengers don't recognise the introduction of consistent feeder models as improvements to the service and can shift to private car use. Such examples are cities with subway systems and internal bus lines, which lost a large share of their passengers when feeder buses were limited to railway stations. What came out was that passengers travelling on shorter distances were handicapped and forthwith decided to shift to other competitive travel modes. Experience therefore shows that in cases where passenger flows are strong it is sensible to provide parallel connections, especially if passengers will benefit. The advantages of such parallel connections are:
- Avoiding transfers for people with problems or have a strong dislike for transfers (functionally disabled population, parents with children's carriages or passengers with luggage);
- Enabling direct connections between areas that are too far from the railway station for access on foot.

The subject of internal physical integration is partly tying PT systems into other transport modes. Above all this means various types of voyages by taxis, especially in time periods or areas, where costs of buses cannot be justified. Another form of integration involves passengers with special needs (school children and workers, functionally disabled, elderly). From the aspect of integration such voyages have an important social role and should be seriously considered in the PT

system's operation. A third form of integration is between PT, private cars and bicycles, which we included in external integration, but despite significant importance for the transport system's operation is not a subject of this article.

3.2 Pricing elements of internal integration

Even integration of pricing in the PT system contributes to better use. Amongst other it is an instrument for preventing unjustifiable differences in fares for transferring passengers, thus becoming a complementary part of the integrated PT system. Passengers that have to transfer on a certain route and don't have the possibility of direct voyages shouldn't be additionally burdened by separate fares. Elements of the integrated pricing system are;

- Combined or uniform ticket, which can be used on all transport modes in the PT system (through ticketing);
- Uniform calculation of fares;
- Network of ticket retail points.

A consequence of introducing the integral pricing system is that the user pays for the voyage and not the transfer and has the free choice of selecting a service for the area and time validated by the paid fare. The singular fare can be used on any transport mode in a given area. The defined area of validity is based on two models (zoned and relational) and depends on the adopted transport policy goals. In the relational method of fare validity the passenger's ticket states between which stops one can travel (generally by using one vehicle). In the zoned model the ticket states thorough which zones the passenger can travel freely in a given time period, meaning that it is valid for a larger territorial unit. In Slovenia we have already introduced the principal of zoned validity, namely in inner city PT with prepaid fares, while singular fares are charged for single voyages and generally without transfers.

From the aspect of the integrated PT system, the zoning model has numerous advantages before the relational model. Above all it eliminates obstacles of transfers and enables spontaneous choice of voyages and PT modes. The zone's size depends on the primary goal, which we wish to achieve by introducing the zoning system. Large zones generally simplify the system's use, but simultaneously distance themselves from economic acceptability and equity of users. The pricing system and general understanding and perception of the system by users are simplified if we choose »large« zones. Therefore the decision about introducing the zone pricing system is aligned to the principle that one of the main motivators for using PT is its simple use.

The uniform calculation of fares implies the same price of all PT services of comparable standard, with supplements paid for above-standard services and use of supporting services (taxi, parking etc.). The main principles in calculating ticket fares are:

- Social acceptability – this principle strives for lowest, but differentiated fares;
- Environmental acceptability – this principle favours lower fares, but not *a priori*;
- Economic acceptability – this principle searches for the appropriate cost and structure of fares, at which lowering of prices wouldn't significantly increase the number of passengers, but could imply significant loss of revenue.

In the integrated pricing system it is also necessary to structure the relation between single, time-limited and prepaid fares. Integration of the pricing system is possible for regular users (prepaid fares are usually the first step in integration), as well as occasional passengers (integration of fares for single or several voyages). Similarly differentiation of fares for particular user groups is also necessary. According to the »fair price« principle fares are generally differentiated by social status, meaning lower fares for groups such as pupils, students, retired citizens, people from demographically endangered areas etc. Often time of use also differentiates fares (outside rush hours, Sundays, seasonal voyages etc.).

According to the defined ticketing system structure, fares can basically be determined in two ways:

- Cost related – the intention being covering the system's usage costs, whereby from all the social costs of the system (external costs, costs of infrastructure and suprastructure, operative costs), we most often consider only the system's operative costs. Since operative costs of a good PT system are by default higher than income from sales of the service, we also separately present social savings, which emerge from diminished use of private cars enabled by PT systems.
- Goal oriented – the intention being achieving certain goals of transport policy.

In the quest for payees of system operating costs that cannot be covered by fares, we speak about two principles:

- »Polluter pays«, which implies intentional higher financial burdening of private car users,
- »Beneficiary pays«, which implies higher burdening of users that have direct benefits from efficient and frequent usage of PT systems (besides users of less burdened infrastructure also e.g. property investors, retailers etc.).

Formulation of the structure and price of fares themselves also uses the principles of »distance digression« and »quantity digression«, which comply to the before stated principles, but whose excessive use can compromise economic acceptability.

Last but not least, we have to point out that recently applied examples of modern tickets that use magnetic chips can significantly alleviate pricing, as well as internal integration of PT systems. Such systems are nevertheless still rather costly.

3.3 Logical elements of internal integration

Achievement of logical integration of PT systems means that users of PT systems should perceive the system as a whole and that the whole PT system should communicate with its users in a uniform fashion. Amongst the three types of internal integration this aspect is the hardest to grasp and achieve, but it is a very important instrument of promotion and potential utility of the system.

The main goal of logical integration is informing users about options and possibilities, as well as elimination of obstacles in using the PT system. A logical aspect of integration above all implies integration of information about the PT network and prices. Information should be made available to the user during the whole voyage, i.e. at the source and target point, at the stops and in the vehicles, by using various forms of communication (written, sound) and various media (e.g. telephones, computers). Information can be static (network of routes, schedules) or dynamic (conditions, congestions).

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Logical integration represents a strong element of using all advantages of the other two aspects of internal integration. Logical integration is only the first step, which is followed by external integration with other transport sub-systems. Such information should support the user in choosing between transport modes and transfer points, including dynamic information about congestions and parking spaces.

4. Conclusion

In conclusion a question emerges, how to transform the considered elements of reform of PT in Slovenia and in conjunction with other elements to practise? The research also dealt with reformed organisation of PT and we discovered that achievement of the set strategic PT development goals would need a new organisation form for planning, managing, financing and executing PT. Actors will have to be defined (institutions, companies etc.) with their functions and responsibilities. Since integration of the PT system was given high priority, the proposal for organisational changes was adapted to this goal.

In our review of possible organisation types we discovered that the basic variable is the relation between public and market-driven initiatives, which affects the PT system's level of regulation or de-regulation. Because of the defined priority of strategic goals the scope of possible organisation forms in Slovenia was narrowed. Strategic goals, such as achieving sustainable mobility within the comprehensive transport policy or integration of the PT system, proved that public interests prevail over market ones, therefore we have to search for a future organisation form, whose system expresses a higher level of regularity. Simultaneously and to avoid its deficiencies it would be sensible to complement the regulated organisation model with market-based elements or to relinquish some of the public responsibilities to market mechanisms.

In other words, to raise the quality of offer of PT, active involvement by the state is essential in the fields of planning, management, financing and implementation. Since the process of integration includes a series of actions, which can be conducted gradually, numerous measures for internal integration can be undertaken soon, before a strategic document is formulated, without relatively massive spending and with many benefits (e.g. joined information about schedules and voyage prices for the whole country in one place and ensuring its simple and free access). What it takes is minor political will and understanding of the issue by decision-makers. Complex integration measures do nevertheless demand a complex approach, longer time spans and in-depth preparation. Hopefully this article is a step in that direction.

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Notes

[1] The research was carried out within the Goal oriented research programme »Slovene competitiveness 2001-2006«.

[2] For example, certain cities introduced ensured transfers by providing taxi transfers free of charge when public transport connections were interrupted.

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Mojca ŠAŠEK DIVJAK

Transport corridors and settlements in a region

Linking settlements to public transport

1. Introductory remarks

Development and modernisation of transport infrastructure (roads and railroads), as well development of energy supply and communication infrastructure, significantly affect settlement development. Sustainable and comprehensive development of Slovenia will therefore be possible only if settlement development is planned parallel to the transport system (with emphasis on public transport), a concept, which should be followed in implementation of spatial strategies, various policies and national programmes. With respect to the planned regional subdivision of Slovenia, such planning is very significant also on the regional level.

Linking settlements to public transport on the regional and municipal level is the core of this article. The topic is highly multidisciplinary, after all various wider fields of physical planning and transport management intertwine, including property, housing policies etc. Urban planning tied to planning public (and combined) transport is a common topic of contemporary urban research (Frey 1999, Calthrope 2001). It can affect efficiency of regional spatial policies, competitiveness of pertaining areas and their orientation towards sustainable development (in the economic, social, and environmental sense). Of course various levels have to be considered.

1.1 International strategies and guidelines

During the ongoing period of tighter European bonding, respect for European spatial policy recommendations, concerning sustainable spatial development of the entire European continent, is vital (CEMAT, 2000). Strategies include development of efficient and environment friendly public transport, which should contribute to sustainable mobility. Similar principles that speak about settlement development and prevention of environmental pollution tied to transport, production and use, are also stated in Agenda Habitat, The Green convention on urban environment, New Charter of Athens etc. All have significance for Slovenia, since it is joining the Trans-European transport network, with links on the V. and X. corridors, which will affect increased development of macro-regional centres, especially Ljubljana, Maribor and Koper.

1.2 National strategies

Implementation of the vision, as well as general planning strategies, demand harmonisation of various policies and national programmes, but also coordination on different levels. The settlement system, with its hierarchy of cities or settlements, represents the nation's basic component of social and economic life. Capacities for performing such functions in cities and their functional regions depend on eco-