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Integrated Transport
Preliminary Communication
U. D. C.: 656.01:65.012.34
Accepted: Feb. 12, 2001
Approved: Feb. 26, 2001

ABOUT THE NECESSITY OF A COMPREHENSIVE EVALUATION OF THE TRANSPORTATION SYSTEM

ABSTRACT

A brief review is given of the current ideas about traffic restrictions and cost of traffic distribution systems including the controversy of individual and public transport under both private and public regime.

KEY WORDS

traffic infrastructure, source-target-logistics

1. REORGANISATION OF THE TRANSPORTATION SYSTEM

During the last few years, the transportation system has been going through considerable changes, which were often implemented at a fast pace. The compulsion for change results from quite different influencing factors (objective as well as subjective ones). Fundamentally, the development of the transportation system can only be seen within the entire social development. Attention has to be paid especially to the changes of the national and international manufacturing conditions in the entire national economy. The globalisation of markets, the possible applications of new techniques and technologies as well as the accompanying growing mobility needs are expressions of these objective influences. As the constantly rising figures in the leisure-time and purchasing traffic show the extension of the subjective individual possibilities and needs (for instance through increasing prosperity, reduction of weekly and total life working time, more and more leisure) is connected very closely with the increasing traffic.

The State, as the up to now most important financier of the public transportation and transportation system, is obviously increasingly overtaxed with these new requirements. Accordingly, a new definition is necessary also for the part of the State during the reorganisation of the transportation system.

The transportation system itself is in interaction constantly with the entire social development. The transportation system first reacts to changed social and economic conditions. For example, the specialisation of the production at far-distanced locations requires an adaptation of logistics with regard to the level of technology and transport technology while the costs for the final product will be minimised. However, traffic itself also causes changes in the social structure. For instance: Due to a modern efficient transportation system, a greater distance between the place of residence and the place of work is possible. The increasing influence of the transportation system on the economy becomes clear through the increasing part of the traffic services as well as of the peripheral industry on the gross national product.

The central issue results from the society's point of view: How much traffic is good and/or necessary for a society? Up to now, this issue was answered more or less arbitrarily. With anyhow doubtful chances of success, a proportionate linkage to economic characteristics (e. g. proportionate gross national product) is also hardly possible [RO99]. A possible course consists in a natural limitation of traffic within the framework of free-market orientated economic structures via the costs. That means, transportation and transport should consider real costs. The price is determined by supply and demand. A support by the community should not occur according to the broadcast principle but only prevent individual social discrimination in the public passenger traffic. Which costs beyond the pure production costs are to be included uniformly in the price formation of the traffic service products (from the economic point of view) is to be defined in the social consensus legislatively.

2. TRAFFIC SERVICES AS PART OF MODERN NATIONAL ECONOMY

In the course of the current transportation system development, attention is increasingly focused on the private-sector traffic service provider. As an entrepreneur, the provider is trying to maximise the profit. Because of the high share of fixed-costs in the transportation system, which especially in the track-guided traf-

fic are allocated from the infrastructure operator (e.g. railway infrastructure enterprise) to the traffic service provider, in the concrete case, by inclusion of the traffic routes and means of transport, an increase in turnover has to be aimed almost automatically. Beside the takeover of competitors' traffic capabilities, the increase in turnover also includes indexing of new businesses. Economically, this is certainly only reasonable on a limited scale. Because of that, a goal conflict arises (especially in the infrastructure sector) which needs independent regulation. As even the most recent past also shows, the request for an independent regulation is qualitatively not fulfilled to a sufficient extent because of repeatedly arbitrary political decisions regarding infrastructure development.

At a political level, only the frame for the development of infrastructure may be defined. International aspects also have to be considered increasingly. The creation of fair terms of competition as well as monitoring of the compliance with these conditions is of crucial importance. The supervision of construction and operation of the infrastructure as well as of the means of transport at a level which is necessary for the public interest includes continuous inspection of the extent of this supervision to avoid inflation of the activity of the administrative body including the accompanying negative effects. In this connection, the creation of a uniform traffic supervisory authority, which is adapted to the modern market structures has to be checked. As a negative example of an outmoded administrative body activity, the still existing strict carrier-specific separation of individual departments at the Federal Ministry of Traffic, construction engineering and housing can be mentioned. To offer a creative frame that takes into account the requirements of modern economy for the traffic service providers, the consideration of a cost-effective development connected with demographic aspects of mobility should also be of central importance for the official activities.

3. IMPLEMENTATION OF TRAFFIC SERVICES INTO THE COMPETITION ON THE MARKETPLACE

One of the most important preconditions for the implementation of traffic services into the competition on the marketplace is undoubtedly the discrimination free access to all infrastructures with identical terms of competition. Free access to infrastructures makes it possible to create complete transport and movement chains by using system advantages of individual carriers. As a result of using these system advantages, a stronger use of the railway could be of interest for the traffic service providers as well as for the passengers (without the necessity of any governmental measures of constraints). The promotion of free-market structures counteracts the currently still existing, artificially created competition between the carriers because the resulting competition between the individual, generally acting carrier-spreading transportation companies becomes the determinant standard.

The necessary change of the legal general conditions, e.g. the passenger conveyance act (PBefG), also has to take into account consistently the new customer relations and the customer relations still to come as an essential precondition for the implementation of traffic services into the competition of the traffic market. How difficult it is to realise this demand, can be seen using as example the comparison of road-bound and rail-bound public transport in [DO00].

The far-reaching change of the customer relationships has a decisive influence on the structures of the traffic market, which is currently in its initial stages. In this connection, the purchaser of traffic services has to be considered as the client. Therefore, e.g. in long-distance rail transport the traveller is the client of the railway transport company. On the other hand, the most important "client" in the suburban rail traffic is the appropriate "Land" (state) as the purchaser of local traffic services. The paying traveller himself carries only a low share of travel expenses. That means, that currently the traveller as a client is only of secondary importance. This becomes virtually clear for example if the schedule offer is considered across the interfaces of the state boundaries.

On the other hand, rail transport companies themselves are also purchasers because they order schedule routes from the railway infrastructure enterprises. Although there have been initial discussions in many forms, currently there are no comparable customer relationships in the field of road infrastructure. In the current situation, there are probably only two fundamental possibilities for the creation of neutral terms of competition:

a) preferably a performance-dependent road user fee / waterway user fee / route user fee for trams and city railways, possibly up to the creation of competitive structures in the infrastructure enterprises (separation of motorway and federal roads, splitting of the railway infrastructure into competitive individual enterprises),
b) consistent incorporation of infrastructure into the community within the framework of the general existence welfare.

Both possibilities may be considered feasible within the framework of the goal setting of an effective development of the traffic market. In compliance with international aspects, in particular in uniting Europe, variant a) is to be favoured because then a market-induced promotion of the infrastructure development becomes largely independent of promotion funds

(also in structurally weak countries and regions). Moreover, infrastructure costs will be allocated performance-independent directly to the infrastructure users without consideration of their origin. Foreign transport companies lose their present competitive advantage in this field (e.g. in road transport).

Variant b) assumes that the policy and the state and/or state community are able to secure a uniform and continuous development of infrastructure in different regions on a long-term basis via strict regulation. Currently, the strong national and international tendency for privatisation in this area speaks against such an assumption. It rather seems that the state is not up to further increasing of tasks of infrastructure development and infrastructure retention. This refers both to the extent of tasks as well as to the shortening of reaction time to the changed conditions. Furthermore, during the realisation of this variant it is assumed that the infrastructure development generally serves as the driving force of macroeconomic development of the regions. Although the influencing factor of 'infrastructure' should in no way be underestimated for the economic development of a region, it is not to be concluded necessarily that infrastructure development automatically leads to an economic upswing.

A combination of variants a) and b) is possible too, primarily if social (e.g. local) interests for an infrastructure development exist. In this case, share of the costs to be defined could be made available as ground rent from the public sector, which will then be completed through reduced user fees. At the same time, there should be no direct competitive disadvantage for an alternative relation. If the combination of variants a) and b) becomes generalised, basic supply in the field of infrastructure within the framework of general existence welfare would be secured. Further extension of concrete infrastructures could be financed via fees.

For the practical realisation of such a model it has to be defined precisely and independently of the project what "basic supply" means. The currently in the railway sector used distinction in local passenger transport (short-distance) and long-distance passenger transport only appears of limited use for this purpose. The following items could be considered as basic supply: creation of a railway infrastructure up to a specific route speed, load capacity and basic performance. All costs beyond this would then be covered by the private sector via compensation for use/rental.

Remarkable are the increasing efforts (currently also in Germany) for a strengthened performance-dependent allocation of infrastructure costs of road transport (cf. [PA00]). Up to now, the performance-dependent share of the costs of road transport costs is composed of the charged mineral oil tax and the value added tax (VAT) for fuel. However, the double taxation thus available is starting to be the reason for repeated criticism. In the future, an additional flat mileage rate will increase the part of performance-dependent costs in this area.

A very detailed expert opinion to the transport cost calculation [DI00] shows transport cost recovery grades - at a rate of return of 2.5% - for national commercial vehicles of the freight traffic of 75.8% (related to the roads in total). In the rail freight traffic of Deutsche Bahn AG (German Railways), the comparable transport cost recovery grade is figured at 15.8%; due to the route prices, additional high performance-dependent parts are already flowing in. Thus, the introduction of flat mileage rate should give an impulse to strengthening of the rail freight traffic, which, however, will not be reflected automatically in an increase of rail freight traffic part within the entire freight traffic. This step has to be seen rather as a chance to force competition equality of different carriers, which is worth of being used actively.

4. APPROACHES FOR EVALUATION OF TRANSPORTATION SYSTEM

If in the future a more or less strong separation of the supply of infrastructures and the implementation of traffic services occurs, several different transport companies are increasingly involved in the offer of a client-oriented "Source-Target Traffic" and the undoubtedly existing advantages of private transport will be included into the systems design, an evaluation of the transportation system will be necessary. From the point of view of free-market traffic service providers, this evaluation of the transportation system considers client-oriented aspects, it supports social decision-making processes for the infrastructure design and it also supports neutral terms of competition for carriers comprehensive several traffic carriers in general, also in the field of infrastructure.

The currently existing evaluation methods refer in each case only to specific sections of the transportation systems. As examples, the following might be mentioned: the Standardized Evaluation of Traffic Route Investments of the Public Passenger Traffic [IN93] as well as the Efficiency and the Performance of Railway Operation Facilities [HE95]. Due to the fact that within the criterion and/or within the used basic requirements in each case the special features of the appropriate subsystem are used as basis, a generalisation by inclusion of private transport is either impossible or possible to a limited extent.

A complete approach for the evaluation of transportation system of complete transport and movement chains also with different carriers can serve as basis for the calculation of traffic services, the order of infrastructure capacities, the preparation of an offer

to the clients but also for the comparability of the offers from the client's point of view. Moreover, it has to be checked in which form the evaluation system which is to be defined is applicable for the evaluation of alternatives for the traffic carrier-spreading infrastructure development with regard to the conditions of the market.

During the transition from the evaluation of individual subsystems to the consideration of the "Source--Target System", the importance is focused on the creation of breaking points at the interfaces of the carriers. Up to a certain grade, minimisation of the breaking points within the transport and movement chains will be possible. Moreover, the objective should be the reduction of transitional periods at breaking points. This can be achieved either as a result of an absolute lowering of the transitional periods themselves or through a combination of breaking points with other services. For the client, an additional direct benefit will be achieved by the temporary overlapping of transitional periods with other services so that this time does no longer emerge as a negative element within the balance sheet of the traffic service. Fundamentally, the negative effects, which occur through the inclusion of additional breaking points at traffic carrier--spreading "Source-Target Traffics", have to be at least balanced in the concrete case through the system advantages of the individual involved carriers.

The travel time is a suitable basic measure for a criterion with the characteristics represented for an entire approach. First of all, as the determinative element for a change of place, the travel time is value--neutral and therefore can be linked with a great number of concrete initial conditions very easily. These initial conditions should describe further aspects (in particular the aspects which are important from the client's point of view as for example the price and/or the costs for the traffic service). In case that the initial conditions are formulated by way of restrictions as travel time equivalents, mathematical model of linear optimisation can be deduced by use of an objective function for minimisation of the travel time. In this case, a computer-aided solution would be possible even with standard software.

Within concrete practice-orientated use, investments could be assessed also beyond pure infrastructure by inclusion of the breaking points as interfaces between the carriers. At an easily feasible calculation of capital costs per minute of travel time (related to complete traffic connections), an approach results for a comparison of variants of different measures with the possibility of a computed distribution via traffic flow to the individual traveller as the transport client; simultaneously a basis for a price formation in the "Source-Target Traffic" results. With these examples only the manifold possibilities, which can be opened up in the case of comprehensive evaluation of the transportation system with the basic measure "travel time" should be mentioned briefly here.

5. THE DEVELOPMENT POTENTIAL OF THE TRAFFIC MARKET

Due to the fundamental changes in the structuring of the transportation system and by use of the resulting potentials, a new quality for the traffic services results. Therefore, the traffic service provider who goes for a development of these potentials early will achieve competitive advantages. In this connection, the internationalisation of traffic, a target group-related specialisation of the offer of individual traffic service providers as well as the close interlacing of production, change of place, distribution and commissioning are essential aspects in order to be able to satisfy the future mobility and transport needs on a high level. Companies (also and in particular carriers in general), which want to offer complete transport and logistics services as a "one-stop service" to their traffic clients need high-quality instruments and techniques. A comprehensive evaluation of the transportation system creates a qualified basis for the decision in the fields of traffic services as well as infrastructure development and at the same time considers entirely the "Source-Target Traffic".

LITERATURE

[BR00] **Bratzel, Stefan**; *Innovationsprozesse umweltorientierter Verkehrspolitik im Städtevergleich*; in: Internationales Verkehrswesen 52 (2000) 3, p. 90

[DI00] DIW Deutsches Institut für Wirtschaftsforschung (Linke, Heike; Rieke, Heilwig; Schmied, Martin); *Gutachten Wegekosten und Wegekostenrechnung des Straßen- und Schienenverkehrs in Deutschland im Jahre 1997*; Berlin 2000

[DO00] **Dostal, Adrian W. T.**; *ÖPSV-Strukturreform: Schlimmbessern oder effektives Zurückdrängen des MIV?*; in: Internationales Verkehrswesen 52 (2000) 3, p. 86

[HE95] **Hertel, Günter**; *Leistungsfähigkeit und Leistungsverhalten von Eisenbahnbetriebsanlagen*, Schriftenreihe des Instituts für Verkehrssystemtheorie und Bahnverkehr, Band 1, Dresden 1995

[IN93] Intraplan Consult GmbH; **Heimerl, G.**; *Standardisierte Bewertung von Verkehrswegeinvestitionen des öffentlichen Personennahverkehrs* im Auftrag des Bundesministers für Verkehr, Forschungsbericht FE-Nr. 70 371/91

[PA00] **Pautsch, Peter R.**; *Streckenbezogene Gebührenerhebung für LKW*; in: Internationales Verkehrswesen 52 (2000) 3, p. 97

[RO99] **Rommerskirchen, Stefan**; *Entkopplung des Wachstums von Wirtschaft und Verkehr?* in: Internationales Verkehrswesen 51 (1999) 6, p. 231