

EXPERT QUESTIONNAIRE ON THE ISSUE OF ECONOMICAL USE OF THE RAILWAY TRAFFIC PATH CAPACITY AND BUILDINGS PREPARATION ON THE RAILWAY

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ABSTRACT. The railway traffic path capacity and the issue of railway buildings planning are topics that are widely discussed in professional groups. Experts often do not share the same opinions on these topics. The issue of the allocation of railway traffic path capacity is given in general legislation and further by regulations or directives of a particular railway operator. Carriers are obliged to agree to these conditions. In the case of railway buildings planning, there are also comprehensive defined procedures and selected methods and models which are used to evaluate buildings planning (for example, a four-stage transport model or a logit model). However, it is appropriate to deal with the idea of whether all these procedures are correct and whether it is not appropriate to make changes, especially in the long-established procedures, that would better reflect the current and future reality and society needs.

KEYWORDS: Railway, railway traffic path capacity, buildings preparation, expert questionnaire.

1. INTRODUCTION

In order to find out the expert opinion on the topic of railway traffic path capacity allocation, especially in the case of overfullfilled infrastructure, and topic of buildings preparation on the railway, an extensive expert questionnaire was conducted in 2021. The questionnaire survey was made on the Google Forms platform. In total, it is a group of 28 interviewed experts from various organizations (railway design offices, infrastructure managers, transport organizers and public administration, academic staff).

2. MATERIALS AND METHODS

Within the issue of railway traffic path capacity and buildings preparation on the railway, a total of 16 questions were asked to the respondents, namely:

- (1.) Do you think that the solution of the railway traffic path capacity, the problem of its use and the methodology of its allocation is a current problem, which should be addressed and paid special attention to?
- (2.) Do you consider that, when allocating railway traffic path capacity, passenger trains in the public service should take priority over open access services?
- (3.) Do you think that, when allocating railway traffic path capacity, long-distance/express international trains should take priority over national trains?
- (4.) Do you think that long-distance/express trains

should take priority over regional trains when allocating railway traffic path capacity?

- (5.) Do you think that, in the case of train route construction, passenger transport should take priority over freight transport?
- (6.) Do you think that in the case of allocating railway traffic path capacity, the occupancy of passengers on individual passenger lines should be taken into account, or individual passenger services (especially in the case of overfullfillment of railway traffic path capacity)?
- (7.) Do you think that when allocating railway traffic path capacity, the technical parameters of the vehicles intersecting with the infrastructure parameters should be taken into account, i.e. the possibility of using the infrastructure parameters (e.g. speed profiles and their levels) by the vehicles used for the given performances (especially in the case of overfullfillment of railway traffic path capacity)?
- (8.) Do you think that the allocation of railway traffic path capacity in case when carriers requirements exceeding its capacity should have the possibility or obligation to propose solutions to satisfy them before rejecting the selected requirements (e.g. by passing selected stops on selected trains to ensure more capacity, connection of selected trains in the critical rails section or to propose the use of other vehicles on selected lines, etc.)?
- (9.) Do you think that in the case of allocating railway traffic path capacity on the line for electric traction,

vehicles that actually use this traction should be subsidized, or vehicles with modern traction drives (BEMU, HEMU/EMU, etc.) should be subsidized?

- (10.) Do you think that vehicles equipped with modern security systems (typically ETCS and GSM-R) should be subsidized when allocating railway traffic path capacity?
- (11.) Do you think that the state or the EU should positively motivate carriers and customers of public passenger transport services (eg subsidy programs) to renew the vehicles or improve its quality in favor of better and more meaningful use of railway capacity?
- (12.) Regional and long-distance services are affected in the case of capacity allocation on one line. Therefore, in order to construct routes for a timetable, long-distance transport routes may be artificially slowed down. In your opinion, what is the possible tolerable slowdown of long-distance trains due to the construction of regional transport routes?
- (13.) Are you aware of any measures from abroad that address situations where there are more requirements for the allocation of railway traffic path capacity and this capacity is insufficient or actually saves railway capacity, even if it is not yet completely exhausted? Can you briefly name these measures and what countries are involved?
- (14.) Do you consider the current methodology of setting parameters (especially routing, decision-making new line x reconstruction of existing line, share of sections with new routing, number of tracks/frequency of passing points, etc.) of new railway infrastructure in the Czech Republic (feasibility study) to be correct?
- (15.) Do you consider the current mechanism used to simulate transport demand in the feasibility studies (transport forecast – four-stage transport model, logit model) to be correct?
- (16.) Do you consider the current mechanism used to assess economic efficiency (as part of the infrastructure decision-making process) in feasibility studies to be appropriate?

The aim of the expert questionnaire was to identify areas and parameters which, in the opinion of experts, should be key in allocating railway traffic path capacity, especially in cases where it is necessary to emphasize its cost-effective use. This is especially the case when the capacity of the railway route is not able to satisfy all the requirements of the carriers imposed on it. At the same time, experts were asked questions concerning the preparation and design of railway lines reconstructions and new railway lines.

Question no. 1: Do you think that the solution of the railway traffic path capacity, the problem of its use and the methodology of its allocation is a current problem, which should be addressed and paid special attention to?

The vast majority of experts agree that solving this issue is very topical. Respondents also generally point to the following issues:

- deal with the quality of allocated traffic path capacity,
- capacity of infrastructure points with low capacity,
- a responsible allocation of railway traffic path capacity.

Question no. 2: Do you consider that, when allocating railway traffic path capacity, passenger trains in the public service should take priority over open access services?

Respondents fairly strongly agree that trains running in a public service obligation should take priority over open access services, however, certain situations are possible that need to be considered carefully:

- in the case of a concession model or open access products on meaningful and regular routes, an open access product can be an essential framework of the system in a given area and should therefore be treated more equally,
- the key is to allocate capacity and design lines with an experience, ie regional or open access transport should not have excessive capacity allocation requirements so that it is ideally possible to offer routes to both segments.

It is often necessary to seek individual solutions, but connections operated under a public service obligation generally show greater stability and predictability with regard to the requirements for their management over longer time horizons.

Question no. 3: Do you think that, when allocating railway traffic path capacity, long-distance/express international trains should take priority over national trains?

In the case of the third question, the opinion of experts is already more diverse, and therefore it is represented by a graphic output.

It is clear that there is no longer such a consistent opinion as in the first two questions among experts, even though international routes are significantly supported by legislation. From the wording of the law, this is quite understandable, as the international route is naturally subject to the coordination of several entities (this is also pointed out by selected experts in the questionnaire survey), on the other hand the respondents to the questionnaire survey point out (although they rather agree that the internationality criterion is important):

- international trains suffer more from traffic irregularities,
- international trains in fact also serve national services; the question is whether the criterion of internationality is actually useful in this context,
- the decisive factor could rather be the transport demand in individual segments or the capacity of

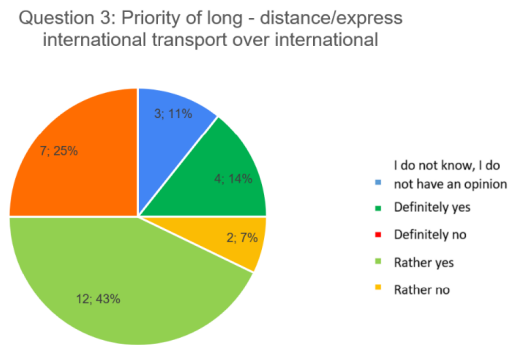


FIGURE 1. Taking into account the occupancy of individual passenger lines.

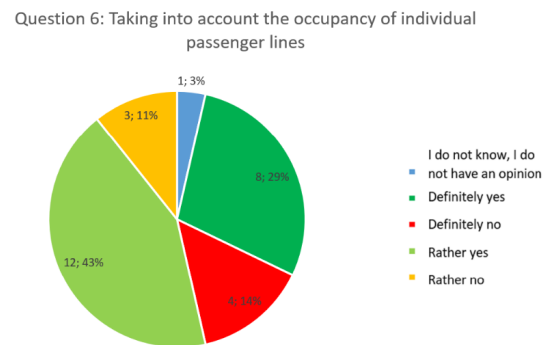


FIGURE 2. Taking into account the occupancy of individual passenger lines.

trains or the intentions of public service authorities and their intersections.

The results of the answers to this question are summarized in Figure 1.

Question no. 4: Do you think that long-distance/express trains should take priority over regional trains when allocating railway traffic path capacity?

The question again increases the heterogeneity of the answer of the interviewed experts, who in this case believe that long-distance/express international transport should rather take priority over international transport. In addition, the experts react freely in the comments to the question:

- it is appropriate to segregate infrastructure for long-distance and regional transport,
- the general opinion is “rather yes”, however, with the solution of specific situations, such as connections between trains, arrivals and departures to nodes, etc.,
- the organization of transport in the event of a delay remains an issue,
- the issue is also the adequacy and transport strength of individual segments, which should be reflected in the construction of individual train routes,
- there was also the opinion that, in contrast to long-distance transport, it is also possible to provide regional buses.

Question no. 5: Do you think that, in the case of train route construction, passenger transport should take priority over freight transport?

In this case, the prevailing view is that passenger transport should rather be preferred over freight transport. The comments of the experts point to the following facts:

- suitability of infrastructure segregation for passenger and freight transport and the need to increase the capacity of sections where not all these requirements can be met,

- suitability of the priority for passenger transport in cases where it provides mainly transport to schools and jobs, ie especially during peak periods,
- preference for freight transport on a given section, where in this case it clearly has a greater societal benefit than passenger transport on such a section of the railway network.

Question no. 6: Do you think that in the case of allocating railway traffic path capacity, the occupancy of passengers on individual passenger lines should be taken into account, or individual passenger services (especially in the case of overfullfillment of railway traffic path capacity)?

The question clearly deals with a topic that does not reflect any of the found legislative materials or regulations. It concerns the issue of passenger congestion on individual rail passenger lines, especially in the case of capacity allocation, where infrastructure congestion occurs. Because this is a relatively complex issue, the graphic output provides a structure for all respondents to answer this question.

Despite the fact that four respondents out of 28 do not strongly support this and the other three also tend to disagree with this step, on the whole scale it can be perceived that this aspect should rather be taken into account. After all, 20 out of 28 experts (more than 70 % of the interviewed experts) stated that it is desirable to deal with this topic and pay attention to it. The results of the respondents’ answers to this question are summarized in the graph in Figure 2.

The open reactions of experts further refer to the following facts:

- the public service authority itself should be able to evaluate what is expedient to provide and what is not so that the capacity is used economically,
- an individual approach is often needed,
- it is necessary to set the parameters of this evaluation, it would have to be a more comprehensive assessment, probably not the only one value of occupancy,

- in some cases such an assessment may be difficult to apply – the difference between the occupancy of the whole train vs. normal occupancy by passengers, how will this be addressed?

If such a principle should be applied, then all open reactions of respondents are in principle relevant and in order to take into account these parameters, it is useful to deal with their solution. In particular, setting only a one occupancy parameter within a line would be more than misleading.

Question no. 7: Do you think that when allocating railway traffic path capacity, the technical parameters of the vehicles intersecting with the infrastructure parameters should be taken into account, i.e. the possibility of using the infrastructure parameters (e.g. speed profiles and their levels) by the vehicles used for the given performances (especially in the case of overfullfillment of railway traffic path capacity)?

Another aspect, which is not so fundamentally taken into account by legislation or regulations, is the possibility of taking into account the technical parameters of vehicles at the intersection with the condition and parameters of the infrastructure. The opinion of experts in this case is absolutely uniform: a significant inclination to take into account the technical parameters of the infrastructure at the intersection with the technical parameters of the used vehicles.

The comments point to the following facts:

- motivate the carrier/public service transport authority by adjusting the price for the use of the track by running the train in case of using adequate vehicles,
- attention is drawn to the homogeneity of routes, where this approach would in some cases not necessarily lead to the desired effect of economical consumption of capacity,
- the technical capacity requirements of the vehicles also depend on the category of trains on which they are operated.

Question no. 8: Do you think that the allocation of railway traffic path capacity in case when carriers requirements exceeding its capacity should have the possibility or obligation to propose solutions to satisfy them before rejecting the selected requirements (e.g. by passing selected stops on selected trains to ensure more capacity, connection of selected trains in the critical rails section or to propose the use of other vehicles on selected lines, etc.)?

Another question asks about the procedure, which is in principle given by the legislation, and that is the situation in which, in case of exceeding the capacity of the railway, the infrastructure manager should propose measures to satisfy most of the requirements. The response to this question is also positive – there is an opinion that it is definitely yes or rather yes.

The comments further mention the following facts:

- it does not have to be strictly an obligation, but a possibility,
- the result should be to find a suitable compromise,
- the infrastructure manager should do this, but the final decision must be made by the client,
- this procedure should be completely natural, as only the infrastructure manager has complete information on the construction of routes on the given section, which other entities do not have.

Question no. 9: Do you think that in the case of allocating railway traffic path capacity on the line for electric traction, vehicles that actually use this traction should be subsidized, or vehicles with modern traction drives (BEMU, HEMU/EMU, etc.) should be subsidized?

The aim of the question was to find out whether, in the case of allocating the railway traffic path capacity, vehicles with ecological and modern drives should also be preferred. It can be summarized that the experts are rather positive about this possibility, they probably evaluate it as a possibility of a meaningful renewal of the vehicle fleet.

Respondents also pointed out the following aspects in their open comments:

- the idea of a bonus for a vehicle performance rather than specific traction,
- the need for a careful assessment in the event of a train (line) switching, eg from an electrified to a non-electrified line – in the case of a meaningful transport concept, the capacity consumer should not be penalized for this approach,
- theoretically it does not have to be a way of bonus, but a penalty,
- can be taken into account in the price for the use of the traffic path,
- it can be a positive motivation to increase the energy efficiency of vehicles.

Question no. 10: Do you think that vehicles equipped with modern security systems (typically ETCS and GSM-R) should be subsidized when allocating railway traffic path capacity?

The mission of the question is to find out the respondents' opinion on the bonus of vehicles that are equipped with devices for the operation of modern security systems, especially GSM-R and ETCS. By its nature, it is also a rather complementary issue in the issue of railway traffic path capacity.

The attitude of the respondents in this case is again rather positive – positive opinions inclined to bonuses prevail over negative ones.

Question no. 11: Do you think that the state or the EU should positively motivate carriers and customers of public passenger transport services (eg subsidy programs) to renew the

vehicles or improve its quality in favor of better and more meaningful use of railway capacity?

Respondents are strongly inclined to support vehicle fleet renewal in order to use the infrastructure parameters better. The following facts are pointed out in the open comments:

- long-term plans need to be truly valid and truly based on,
- this topic must be carefully defined,
- in this case, it may be appropriate to further improve communication between the various actors in order to make investments on all sides more meaningful,
- in the case of negative answers (only four out of 28 respondents), the idea is not to support vehicle subsidies completely or it is difficult to define subsidy rules from the point of view of this issue.

Question no. 12: Regional and long-distance services are affected in the case of capacity allocation on one line. Therefore, in order to construct routes for a timetable, long-distance transport routes may be artificially slowed down. In your opinion, what is the possible tolerable slowdown of long-distance trains due to the construction of regional transport routes?

When constructing long-distance and regional transport routes, it is clear that the requirements interact. And not only by connections at selected railway stations and nodes, but also when crossing these connections and in this case also when overtaking them. If the infrastructure is in ideal condition and meets all requirements, then it is possible to adapt it so that the mutual influence during crossing and overtaking should be completely minimized or eliminated. The mutual delay of these actions should be close to zero.

Therefore, in order to construct a timetable, long-distance transport routes may be artificially slowed down. Then there is the question of what is the possible tolerable slowdown of long-distance trains due to the construction of regional transport routes. The results of the respondents' answers to this question are summarized in the graph in Figure 3.

Although the question was formulated a bit more complicatedly than the others, the reactions of the respondents again give a relatively clear opinion on this issue. Experts believe that due to the construction of regional transport routes, an additional charge on the travel time of long-distance trains of up to 5%, resp. up to 10%. Other answers were chosen by a very small number of interviewed experts.

Respondents further state that segments can naturally affect each other, the individuality of the approach is also important and this approach must not "break down" the system as a whole. Regional and long-distance transport systems are interconnected and must cooperate. However, the additional charge (its amount globally) can be difficult to determine,

as some opinions point out. However, there is also a very clear idea that quality buildings preparation and compliance of the timetable according to the proposed model in the project should work in such a way that such additional charges should ideally not be necessary.

Question no. 13: Are you aware of any measures from abroad that address situations where there are more requirements for the allocation of railway traffic path capacity and this capacity is insufficient or actually saves railway capacity, even if it is not yet completely exhausted? Can you briefly name these measures and what countries are involved?

Question no. 14: Do you consider the current methodology of setting parameters (especially routing, decision-making new line x reconstruction of existing line, share of sections with new routing, number of tracks/frequency of passing points, etc.) of new railway infrastructure in the Czech Republic (feasibility study) to be correct?

There is a very slight inclination to the opinion that the current methodology of setting parameters of new railway infrastructure in Czech Republic is correct.

The following facts are pointed out in the comments:

- deformations occur, e.g. political pressures,
- experience varies from building to building,
- it depends a lot on the abilities of evaluators and processors,
- the database is often the problem; some data are hardly available, others work with imprecise estimates,
- the current methodology partially denies "healthy" generosity and does not allow the infrastructure to be dimensioned so that it is sufficiently robust when needed during the horizon of its use.

In the case of this question, it is a question with a rather significant contradiction of opinions. Suggestions for improving the method are given for both positive and negative opinions, although the positive opinion actually prevails very slightly. However, it is clear that almost no one perceives the method as "all-salvage". Negative or rather negative opinions are evident in all professional groups, so it is not even possible to generalize that some of these groups are more critical.

Question no. 15: Do you consider the current mechanism used to simulate transport demand in the feasibility studies (transport forecast – four-stage transport model, logit model) to be correct?

There is a slight inclination to the opinion that the current methodology used for modeling transport demand within the framework of feasibility studies (transport forecast – four-stage transport model, logit model) is correct. However, it is also necessary to state

Question12: Influencing regional and long-distance transport by the construction of routes

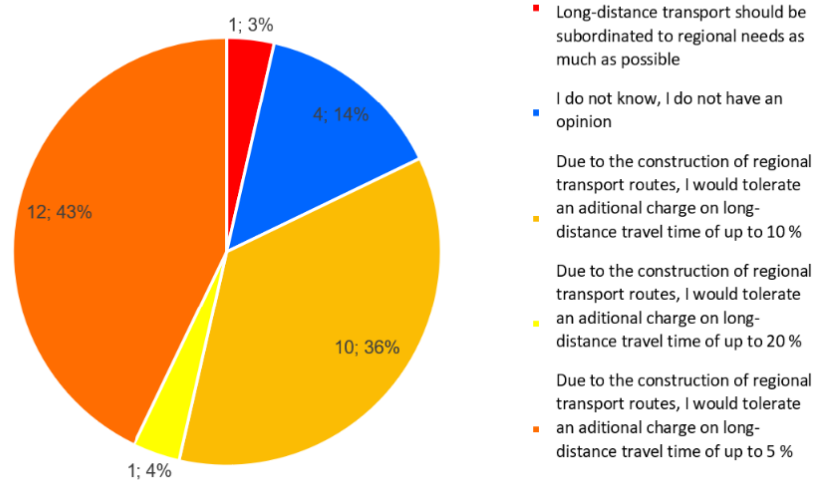


FIGURE 3. Influencing regional and long-distance transport by the construction of routes.

that a relatively significant part of the respondents did not know or had no opinion on this question (almost 40 %) If this part were excluded from the evaluation, then the positive opinion is quite obvious.

The following facts are pointed out in the comments:

- the need to carry out careful calibration and verification of the model,
- the necessity to work with longer historical time series,
- better take social trends into account,
- it may involve working with inaccurate numbers.

Rather negative answers to this question – 3 in total – were identified in the case of a representatives of the railway operator, public transportation organizers and the academic sphere. There is not a greater number of negative answers in any of the groups.

Question no. 16: Do you consider the current mechanism used to assess economic efficiency (as part of the infrastructure decision-making process) in feasibility studies to be appropriate?

There is a very slight tendency to believe that the current mechanism used for evaluating economic efficiency (as part of the decision-making process on the final design of infrastructure) within feasibility studies is correct.

The following facts are pointed out in the comments:

- the economic assessment should be expanded to include other aspects, some are not affected at all, some are, on the contrary, overestimated; the methodology needs to be constantly improved,
- it is a complex process, where the problem can be seen in its deformations and difficult applicability to certain situations,

- very much depends on the ability of the submitter,
- perhaps a tool enabling more dynamic network development would benefit from the evaluation.

Rather negative answers to this question appeared in practically all interviewed groups, however, the greatest disagreement with the incorrectness of the current procedure can be seen among representatives of the academic sphere.

3. DISCUSSION AND CONCLUSION

Thanks to a sample of 28 experts in this field, who participated in its completion, the expert questionnaire provided a comprehensive view of this relatively complex and discussed issue. Given that the respondent was given the opportunity to specify their choice more specifically with an open answer to each question, this questionnaire provided a wide range of opinions.

Practically by all questions have been shown (to a greater or lesser extent) to be a matter for reflection among experts, and in addition to closed answers, they have often provided an opinion on what should be improved or done differently. The results of the questionnaire clearly have shown the need to address the issue.

From the opinion of experts on the issue, it turns out that in the cooperation of individual segments of public transport and the allocation of railway capacity (especially in the case where the infrastructure shows congestion) and the solution of railway construction preparation, it is appropriate to generally take into account:

- Consider the intersection of technical parameters of vehicles and infrastructure; vehicles with better technical parameters should generally be able to consume the railway traffic path capacity more

economically. This situation can be supported by appropriate subsidies for such vehicles, including alternative propulsion.

- Consider the occupancy of individual lines by passengers; however, this parameter must be chosen very sensitively and carefully. Probably it should not be a single number, but multiple occupancy parameters. It is also necessary to realize that the large capacity of a train in the selected section does not necessarily mean a large occupancy of passengers.
- The regional and long-distance transport segments should be affected as little as possible; ideally, in congested sections, everyone should have their own infrastructure.

- The criterion of the internationality of the route is to a large extent relevant, however, it is necessary to take into account the importance of the line as a whole (its passage through the territory and the guaranteed connections to it).
- Overall, public rail transport services should take priority over other products, however, even open access products may show signs of systemicity.

ACKNOWLEDGEMENTS

The contribution was made with the support of the Student Grant Competition of the CTU in Prague within the framework of project No. SGS20/138/OHK2/2T/16 Determination and optimal use of railway transport route parameters.