

# **Railway infrastructure charging in Hungary**

## **Key implementation issues**

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### *Abstract*

*The authors give a short description and evaluation of the reorganisation process of the Hungarian Railway in connection to the tasks defined by the EU directives. The main part of the paper presents the structure of the infrastructure charging system implemented in the Hungarian Railway. The methodology of the line categorisation and the determination of the parameters reflecting the quality of tracks and stations are also discussed by the authors. The cost calculation model for the infrastructure charging system has been based on the existing data collection system of the company. The conclusions sum up the expected results and the further development of the cost allocation system.*

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## 1. Introduction

### 1.1 The reorganisation process of the Hungarian Railways' and the tasks defined by the EU-directives

The directives of the European Union – which are about the operation of railways – have to be taken into consideration in the course of the railway-reform at the Hungarian State Railways' Inc. During the negotiations about accession, Hungary has confirmed that the country is capable of accepting and applying the rules of law relating to transport in the light of the derogations which were asked. With the initialisation of the contract of accession, Hungary admits the treaty and the secondary sources of law till the accession, as a compulsory fact.

In a lot of EU documents – relating to railways – there are directives, which are accepted by the EU Council, with regulations determining the importance from the point of view of the reorganisation of railways. These are the following:

- the 2001/12/EC, which has amended the 91/440/EEC directive on the development of the Community's railways
- the 2001/13/EK, which has amend the 95/18/EK directive on the licensing of railway undertakings
- the 2001/14/EK, which replaces the 95/19/EK directive on the allocation of railway infrastructure capacity and the levying of charges for the use of railway infrastructure and safety certification.

The regulations of the directives – which are compulsory – have to be built in the national jurisdiction. The 15/2002 (II. 27.) KÖVIM (Ministry of Transport and Water Management<sup>1</sup>) decree on the working permission of the railway companies was made according to these obligations so as the following decrees which are at the ratification stage and were formed on the basis of the regulations of the directive 2000/13/EC:

- Decree of the Minister of Economy and Transport and the Minister of Finance on the charge for the use of railway infrastructure (Charge-order)
- Decree of the Minister of Economy and Transport on the allocation of the railway path capacity (Capacity-order)
- Decree of the Minister of Economy and Transport and the Minister of Finance on the accountancy separation of railway-activities within railways companies.

The Charge- and Capacity-decree will become effective on the day when the law pronouncing the international contract on the accession of the Hungarian Republic to the European Union comes into force.

Taking into consideration the directives determined by the European Union relating to railway organisations The preparation of the new railway law has become faster.

The EU-directives prescribe the shaping of a railway organisation, which are the following:

- in state competence:
  - o the corporation which permits the operation of railways companies
  - o the organisation which is authorised to publish the safety certificates, which determine the safety requirements of railways companies
  - o the “regulating body” which controls the application of rules in the community and manages appeals

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<sup>1</sup> In the May of 2002 the name of the ministry was changed: Ministry of Economics and Transport

- the organisation which determines the charge for the use of railway infrastructure and which distributes capacity, if the passenger, freight and traction unit and the infrastructure are not separated
- in company competence (as an independent company or as a separated one according to the regulation):
  - the companies providing services for the passenger, freight transport and traction
  - the (infrastructure) organisation which manages the infrastructure.

Organisations and those connections to the EU-conform Hungarian Railways system can be found in Appendix 1.

The EU made up the following financial principles on behalf of the opening and the free access to railway paths:

- the principle of transparency
- the prohibition of cross financing
- the principle of cost bearing
- the accountancy separation of passenger and freight transport
- the principle of open access to tracks

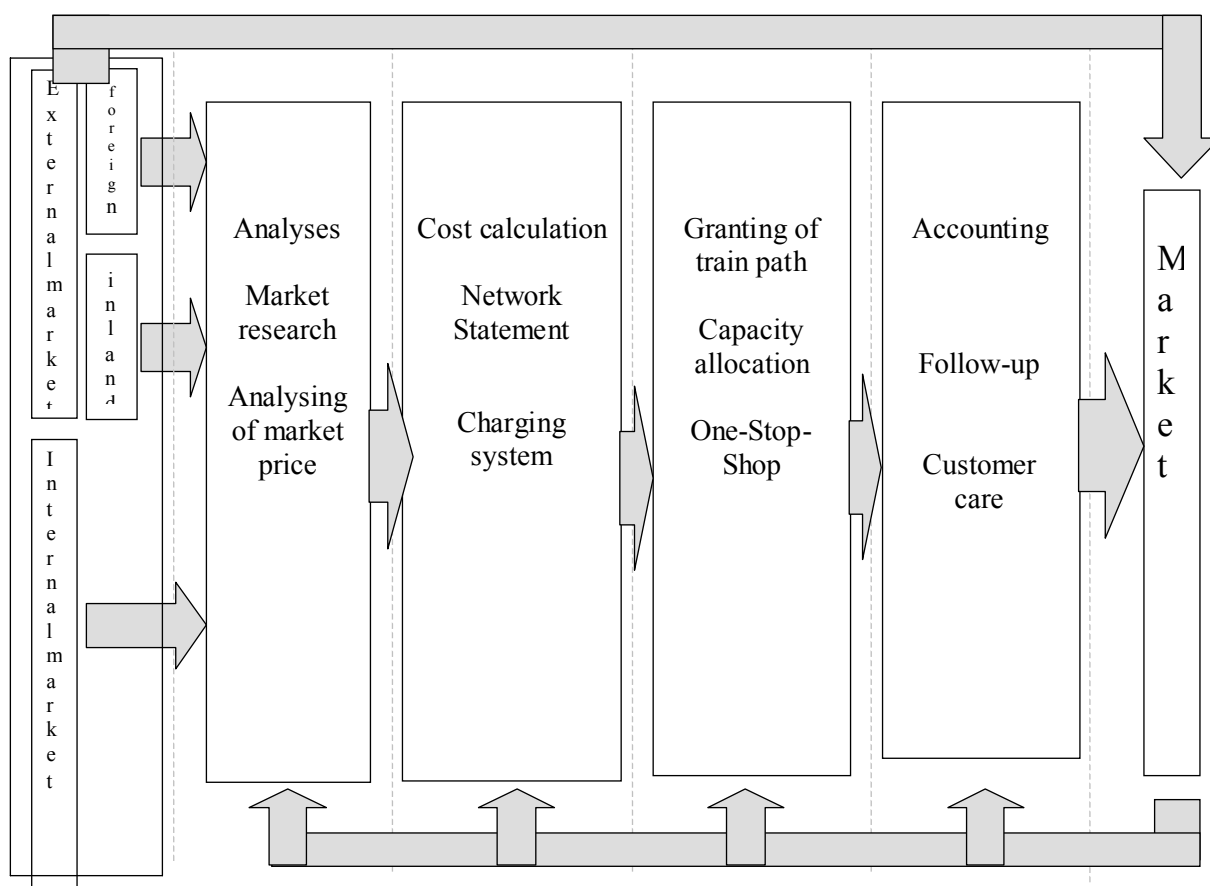
The member states have to assure the separated keeping and publishing of the profit and loss (result) statements and accounts of the railway company (or organisation unit) providing transport services and infrastructure management. The public funds, which are given to one of these two main activities cannot be remitted to the other field. This restriction has to find an expression in the accountancy of this two activity fields.

## **1.2 Evaluation of finished tasks and of the tasks in process**

The 2001/14/EC directive is converted only fractionally into the business plan of MÁV Rt. due to lack of state subsidies. Within the framework of the institutional reform, which serves the shaping of an EU-conform railway, the accountancy separation of the railway business fields – which practically means an independent controlling, balance, result-statement and business report - have to be realized according to the EU directives.

The inner separation – by business fields – of the MÁV Rt. on the level of the balance and result-statement is realized through the ledger accounts, which are kept independent in each organisation from 1 January 2003. At the individual business fields a functional model has to be shaped, which is bound to state rail subsidies, and which precludes the incompatibility and cross financing.

The 2001/14/EC directive prescribes the co-operation between the infrastructure-managers (IM) in order to make planning and allocation of capacity more effective for those requiring paths crossing more than one network. Within the framework of the Trans-European Railway Freight Network (TERFN) they are supposed to make a common network of OSS (One Stop Shop) offices at national level in order to provide international timetabling train paths and services without delay.



All IM representatives have to take part in the process made for harmonising of the allocation of capacity at international level if the decisions on allocation have an effect on more than one IM.

In order to achieve these aims the RailNetEurope (RNE) organisation was formed. The MÁV Rt. is not a member of this international collaboration between IMs yet but becoming a member – because of even the EU-conform operation – would be reasonable.

The main point of the new system issued in accordance with the directives is that the IM assures train paths and services to passenger and freight transport companies, with the help of a non-discriminatory capacity-distributing system on payment of the charge for the use of railway infrastructure. The main working process is illustrated in Figure 1.

Figure 1: Main working process in the train path market

The 2001/14/EC directive prescribes the preparation and announcement of the Network Statement (NS). The NS gives the formal frame for which railway company on which conditions, and with which method of payment of charge can use the railway infrastructure and the advertised services on the available infrastructure. The basic conditions of the non-discriminatory providing of infrastructure services is that the infrastructure organisation should have the instruments to the production of service outputs and the personal transport and freight companies should not be able to influence the employment of services by a third party interested.

The deadline for the announcement of the NS is for the EU member states 15. March 2003 for the timetable period 2004, and for the timetable period 2005 it is 14 December 2003. The MÁV Rt. makes the system of demand and treatment of the train path and the supplies connection with the path for the timetable period 2005 on EU-conform way available. In 2004 it will only come to the treatment system of the demand of requests for ad-hoc train paths and the test application of the regulations which will come into force in 2005. The NS, which will be issued on 14th December 2004, will involve the regulations about the common application of the capacity-allocation and charge for the use of the railway infrastructure, which are prescribed in the EU directives and concern all train path requests.

The EU-conform charge for the use of railway infrastructure to be introduced have to assure the computable (e.g. through the categorisation of track sections and stations) and the reimbursement of costs needed at the same time, and it has to be fitted to the charging-system of the neighbouring countries at international level. Making a comparison between services given to railway companies in Annex II in the 2001/14/EC directive and the services suggested to be announced by MÁV Rt. it can be verified that the levied basis price for providing of the minimum access package harmonizes with the services counted in the 2001/14/EC directive, but there are some differences in respect of services in the minimum access package (partly in the system of the EU-conform services). The reason of this is that the present system about output-measure and cost-collection makes available only the announcement of less detailed service charge.

The naturals which make available the measure of the given service (unit of measure) in the interest of the EU conformity have to be determined, an activity-oriented prime cost-counting and an accountancy system have to be shaped for the price calculation of the output-unit of the services.

For the railways having centre in one of the European Union member states the usage of infrastructure can be restricted (in Hungary the TINA Network) to 20 % of train-quantity which is counted taking the practical exploitation into consideration till 31st December 2006. Relating to this, the Capacity-order determinates the rules of procedures and principles of the capacity allocation of the state-wide railway path.

With capacity-analysis the infrastructure manager determines those bottlenecks, which hinder the appropriate satisfaction of the requests, it reveals the causes of the overloading, and it suggests short and middle distance measures (capacity expansion plan) in interest of the reduction of the overloading to the minister of economy and transport, who represents the Hungarian State, as the owner of the railway path.

A new directive about the safety certificate will come out probably in this year. After that the touched ministry order might need some shaping.

## **2. Infrastructure charging system implemented**

### **2.1 Objectives of charging system**

The infrastructure charging system to be introduced should comply with the Directives of the EU (2001/12, 2001/14 EC) – **competitive and reasonable price**, marginal costs coverage, **international comparability**. The model should meet these multi-criterial requirements.

The development of the infrastructure charging system entails restructuring the financing model of railway companies and the IM, establishing a new system of budget funds in such a way that the Railway Undertakings will be able to pay the infrastructure charge.

When defining the amount of infrastructure charges attention should be paid to the charging systems of neighbouring countries, too.

Infrastructure charges express the general quality of and the demand for railway infrastructure. Their value – taking into account also the variability of budgetary subsidies – shows how the service quality of railway infrastructure changes. It is also a direct feedback on how a possible increase or decrease influences the quality of railway transport. Furthermore, it gives hints as to what costs are needed to establish or keep up a certain level of quality under given circumstances in transport policy.

A relevant criteria to be followed in the process of determining the charge is that – compared to the infrastructure of other European railways – on the one hand it should reflect the present situation of railway infrastructure, on the other hand, – bearing in mind the EU Directives – it should inform the national and international private or state-owned railways about the charge to be paid for the use of infrastructure (line section, line, network).

When calculating the infrastructure charge the fact that passenger and freight transport undertakings have different needs towards the railway infrastructure should be considered, too. These needs are of different importance at the certain transport activities.

The model is based on setting up the Description of Services (basic services, additional services, ancillary services) within the frames of contractual relationship (RU – IM) for a specific term (the term of contract) comprising the requested services. The contract contains the qualitative criteria of the infrastructure to be allocated (speed, axle load, interlocking/safety installation), the applying provisions of service safety, responsibilities, as well as the total amount of the infrastructure charge to be paid for services (as calculated on the basis of the planned performance for the term of contract), which is later settled according to the actual performance. In the contract the question of compensation should also be specified (in case one of the parties fails to perform, or does not perform according to the contract).

## **2.2 Principles and characteristics of the Hungarian infrastructure charging system implemented**

### **2.2.1 The two-tier, two-part model**

The service-based model is built up on the two-tier (tariff) system. The essence of the **two-tier system** is that the infrastructure charge is the total sum of the basic charge and the charge for the services utilized. The quotient of the total charge paid by RUs and the total expenditure of the IM gives the degree of costs covered. The infrastructure charge may comprise only the costs that incurred directly by train operation. In case of some service charges – depending on their categorization – costs or part of the costs incurred here can be taken into account.

The charging system consists of **two parts** because the infrastructure basic charge comprises a **fixed charge** (independent of the volume of infrastructure use) and a **variable charge**. The variable charge may consist of several parts itself.

For newcomers RUs or RUs applying for odd train paths paying the fixed charge may mean a heavy burden or even deter them from entering the infrastructure – therefore the definition of this fixed charge is a complex task. The definition of the fixed charge should be done on the basis of the number of trains or train paths.

The advantage of the two-part tariff is that besides the fixed charge, the RU pays a relatively smaller charge and thus is motivated to increase traffic. Together with the initiation of extra traffic, the principle of the „user pays” is also accomplished.

The implementation of this charging system promotes a just social sharing of burdens between the actual users of the infrastructure and taxpayers when reimbursing the costs of IM.

### 2.2.2 Train types and line categories considered when defining infrastructure charges

Since on the same line more parties (freight-passenger) operate trains, for these distinct segments appearing on the market as applicants for train paths different charging schemes should be set up. The total of infrastructure charges is the sum of charges paid by long distance passenger (ldp), short distance passenger (sdp) and freight transport (f).

The infrastructure charge should be differentiated according to the quality of service (quality criteria of the infrastructure) on the particular linesections. In theory each linesection (statistical section) could have a separate charge, however, in order to facilitate use, to simplify the system, and for reasons of international publishing it is advisable to set up three different line categories:

- I. 1st-category (advanced) lines [international routes (corridors)]**
- II. 2nd-category (normal) lines [domestic mainlines]**
- III. 3rd-category (local) lines [regional (branch lines)]**

Thus the three line categories and three main activities generate nine formulas for the basic charge (BC).

Categories of the basic charge

Table 1

Line category Type of train/main activity	1st-category (international) lines (il)	2nd-category (domestic) lines (dl)	3rd-category (regional) lines (rl)
Long distance passenger traffic (ldp)	$BC_{ldp, il} = BC_{fixed, il} + BC_{variable; ldp, il}$	$BC_{ldp, dl} = BC_{fixed, dl} + BC_{variable; ldp, dl}$	$BC_{ldp, rl} = BC_{fixed, rl} + BC_{variable; ldp, rl}$
Short distance passenger traffic (sdp)	$BC_{sdp, il} = BC_{fixed, il} + BC_{variable; sdp, il}$	$BC_{sdp, dl} = BC_{fixed, dl} + BC_{variable; sdp, dl}$	$BC_{sdp, rl} = BC_{fixed, rl} + BC_{variable; sdp, rl}$
Freight traffic (f)	$BC_{f, il} = BC_{fixed, il} + BC_{variable; f, il}$	$BC_{f, dl} = BC_{fixed, dl} + BC_{variable; f, dl}$	$BC_{f, rl} = BC_{fixed, rl} + BC_{variable; f, rl}$

### Charges to be paid for services (second tier)

IMs – apart from access to the infrastructure – should provide other services. Besides, they may offer certain additional other services.

Track access to services facilities is provided by the IM regardless of the fact who operates he facilities. Additional or ancillary services could be provided directly by the IM using his own facilities or could be provided as mediated services.

Within each service package prime cost for each type of service (and within the type also for each category) should be defined. Following this, depending on the ability of the market to pay (additional and ancillary services) it can be taken into account when developing the charge.

Charges for access to services facilities cannot exceed the flat costs incurred when providing them.

The difference between the prime cost of services and the direct costs of services is covered by state subsidies<sup>2</sup>.

The comparison made between the services provided by MÁV and to be provided by the 2001/14/EC directive can be seen in Table 2.

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<sup>2</sup> When calculating the charge for certain services (“track access to services facilities”) in Annex II of the 2001/14 EC Directive the costs directly incurred, whilst in case of ‘supply of services’ the prime cost of services can be incorporated into the charge. Charges based upon prime cost do not cover the costs of the IM incurred in connection with the provision of services. The missing amount should be covered by the state.

Table 2

Charges levied for services suggested to be offered		Services according to 2001/14/EC directive
Basic charge	Charge for granting train path	Providing train path (handling of requests for capacity, allocating of train paths, the right to use capacity granted)
	Charge for running of a train	The use of track and signalling instalments at stations and on open track. The arrangement of train service
Service charge	Charge for the use of catenaries	The use of catenary system
	Charge for the use of stations (stopping) by passenger trains	The use of passenger stations, the infrastructure of stations and halts and their buildings
		The use of passenger processing facilities and passenger compartments
	Charge for the use of stations (reversing direction) by passenger trains	The use of passenger stations, the infrastructure of stations and halts and their buildings
		Formation and serving of passenger trains
	Charge for serving of trains	Access to and use of public access loading sidings, tracks in service and loading sites
		Access to traction sidings
		The use of sidings assuring access to freight traffic terminals and serving
	Charge for shunting	The use of marshalling yards
		The use of shunting facilities at stations Splitting and formation of trains

Services listed in the directive have been divided into 6 main service groups. The reason for this was that the data needed for the calculation of charges are only available in such separation.

### 3. Parameters describing the quality of the track and station infrastructure. The methodology of categorization

#### 3.1 The methodology of categorization of line sections, parameters describing the quality of track infrastructure

The categorization of tracks is done on the basis of the quality parameters of tracks. The criteria determining the service quality of the rail track in connection with application for the given train path (Table 3):

The criteria determining the service quality of the rail track

Table 3

<b>Development parameters</b>	<b>Criteria determining service quality</b>
Speed (km/h)	Speed applicable on rail section (decreased by permanent speed-restriction signals)
Axle load (t)	Axle load permitted on line section
Electrification	Yes / No
Number of tracks	One / Two / More
Safety installations	The collection of safety parameters: the type of safety installations of rail section, the safety of level crossing and the ground-train radio are weighted in this parameter.
Train control system	Train control system applied on track section
Sequence of train	The number of spaces and the type of operations process are weighted in this parameter.
Economic value	It refers to the marketability of train path.

In order to be able to compare line sections on the basis of quality criteria, the weight of certain factors determining the criteria need to be defined.

Given that there are two kinds of distinct transport operation occurring on the railway line, and considering the demand towards the infrastructure of each of these operations is a result of difference in the importance of characteristics that define quality criteria, the percentage of parameters of quality criteria should be calculated separately for each kind of operation.

The weight values of criteria relating to capacity, the scales belonging to parameters ( $\alpha_{jp}$ ) and the values of standard-multipliers ( $\beta_i$ ) can be found in Appendix 2.

After measuring the parameters describing the quality of line sections the classification of line sections can be determined.

### 3.2 Standard-level of statistical sections

The standard-level of statistical sections ( $Sl_p$ ,  $Sl_f$ ) can be calculated by the next functions:

$$Sl_p = \sum_{ij} (\alpha_{jp} * \beta_i) \quad \text{- passenger}$$

$$Sl_f = \sum_{ij} (\alpha_{jf} * \beta_i) \quad \text{- freight}$$

Classification of statistical sections for passenger traffic

Table 4a

<b>Characteristics of statistical section</b>	<b>Classification</b>
$Sl_p < 0,4$	Local
$0,75 > Sl_p \geq 0,4$	Normal
$Sl_p \geq 0,75$	Advanced

If  $Sl_p \geq 0,75$  then the given track section belongs to category I (advanced line).

If  $0,75 > Sl_p \geq 0,4$  then the given track section belongs to category II (normal line).

If  $Sl_p < 0,4$  then the given track section belongs to category III (local line).

Line categorization from point of view of freight and passenger trains is illustrated in map (Annex I, II).

### 3.3 The methodology of categorization of stations and halts. Parameters describing the services provided by the passenger-pick up places in the point of view of passenger traffic

Each location – in the point of view of usage of immediate, origin and destination station, and charge of usage– has been categorized on the ground of establishment built, service quality of instalments and expense-demand. The factors ( $T_{s,i}$ ) taken into consideration in the course of categorization of locations from point of view of passenger trains:

- Number of main tracks**
- Height of platform**
- Length of platform**
- Way of approaching the platform**
- Method of customer care along platforms and in passenger buildings**
- Characteristics of passenger processing buildings**
- Characteristics of transport connection of passenger-pick up places**
- Structures build for passengers for protection against weather**
- The characteristics of telecommunications and commercial services**

The weight of factors taken into consideration for joint appreciation and values referring to the quality of services ( $S_{p,j}$ ).

$$\gamma_s = \sum \sum T_{p,i} * S_{p,j}$$

Classification of statistical sections for joint traffic

Table 4b

<b>Characteristics of stations, halts</b>	<b>Classification</b>
$\gamma_s < 0,4$	Local
$0,75 > \gamma_s \geq 0,4$	Normal
$\gamma_s \geq 0,75$	Advanced

If  $\gamma_s \geq 0,75$  then the passenger-pick up place belongs to category I (advanced station).

If  $0,75 > \gamma_s \geq 0,4$  then the passenger-pick up place belongs to category II (normal station).

If  $\gamma_s < 0,4$  then the passenger-pick up place belongs to category III (local station).

#### 4. Cost calculation model for infrastructure charging system

Numbers of the ledger of 2001 were used for pre-calculation of the infrastructure charge for 2003 taking into consideration the price-effects forecasted for medium-term business calculation:

- Expenses of the current infrastructure unit
- The expenses of Traffic Operating Department were rectified by the planned rearrangement of freight transport stuff in 2002 and passenger transport stuff in 2003
- The expenses of shunting and wagon-inspection were used as basic from the functions of the Traction Unit
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##### 4.1 Model of cost allocation

The cost-calculation of infrastructure services planned can be seen in the following graph (Figure 2)<sup>3</sup>.

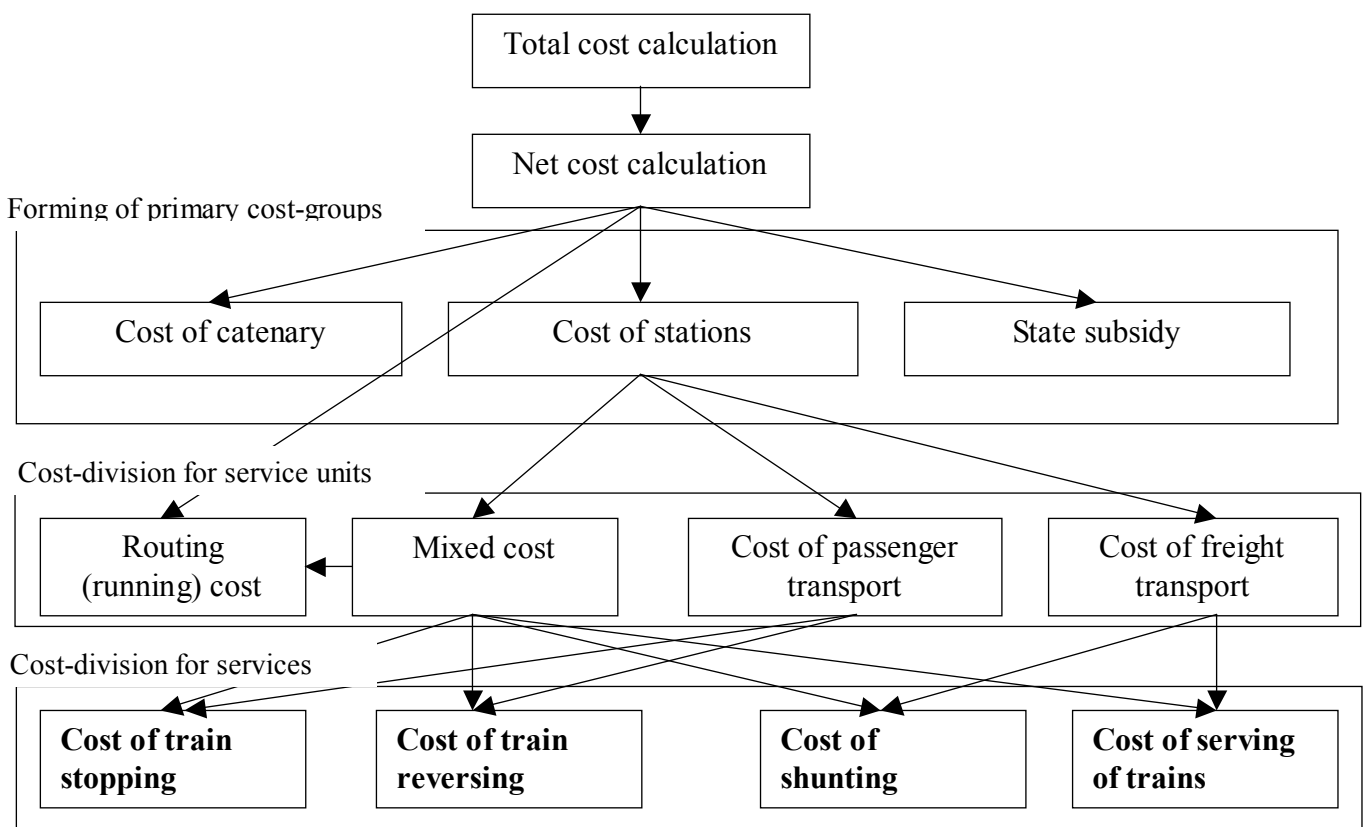


Figure 2: Cost allocation model

The detailed cost allocation methodology will be demonstrated in the Budapest Seminar (in October, 2003).

<sup>3</sup> Cost allocation is based on the existing data collection system and reflects an average costs approach (for the further development see the Conclusions)

## **4.2 Determining cost elements, cost-drivers for charging system**

### **4.2.1 Total cost calculation**

The total cost of the infrastructure contains:

- The costs and expenditures of the current infrastructure unit
- The costs of the Traffic Operating Department
- Management costs distributed to the infrastructure
- Traction services used

### **4.2.2 Net cost calculation**

The net costs of the infrastructure contains the total cost of the infrastructure reduced with the costs of

- External return from sales
- Investment and restoration charged to other business unit
- Self-executed investment and restoration.

#### **Cost of catenary and substations**

Maintenance and devaluation of catenary system on open and station tracks, supervision of heavy-current equipments and network, standby for preventing breakdowns, maintenance and devaluation of transformer station were calculated directly.

#### **Cost of passenger trains' stoppings**

Costs incurred at stations in relation with passenger transport – flowering, maintenance and devaluation of pedestrian subways and footbridges – were calculated directly while operation and station costs are taken into consideration indirectly in proportion of the number of stopping and reversing trains.

#### **Cost of passenger trains at stations where trains reverse directions**

Costs in relation with the cleaning, stocking (water, paper towel etc.), heating, lighting of trains and shunting at stations were calculated directly, while operation and station costs are taken into consideration indirectly in proportion of the number of stopping and reversing trains.

#### **Marshalling cost**

Costs of shunting (flat and hump-shunting) of freight wagons, inspection and the costs of safety installations, heavy power maintenance and devaluation were calculated directly, the costs of traction and the operation units which are in connection with shunting are also taken into consideration directly. Costs of the operating panel are divided uniformly.

#### **Costs of serving of trains**

The access and usage costs of public loading sidings, traction sidings and sidings securing access to freight traffic terminals and establishments and the traction costs were calculated directly. The costs of the operation unit in relation with shunting are taken into account directly while the costs of the operating panel are divided uniformly.

### **Routing (running) costs**

It contains the costs of open tracks, train running costs out of the station costs (divided in proportion of derived number of trains), the devaluation source of restoration and other operational costs against state subsidies.

### **Costs to be considered in calculating the infrastructure basic charge**

The basic charge consists of the following elements (only direct costs are considered):

1. Access charge – fixed part
2. Charge for the running of the train – variable part

Besides the fixed and variable parts (first tier/step), charge for additional services and ancillary services are calculated in the “second tier (step)”. The two-tier system also contains mark-ups, discount and compensations.

The **fixed charge** covers the general costs which are not directly related to traffic or performance. According to the interpretation of the Directive 2001/14/EC this element of the charge is to cover the costs incurred by providing the train path. This amounts to the cancellation fee.

When investigating the distribution of expenses incurred at the provision of train paths between passenger and freight traffic, we can conclude that taking the **number of trains** as a basis, passenger trains would have to pay larger amounts of the infrastructure charge, whereas taking gross t/km as a basis would cause freight trains to pay more.

The amount of fixed charge for running a single train (except for gross t/km as a basis) is acceptable, and would not hinder RUs from entering the infrastructure.

The **variable part** of the infrastructure charge - pursuing the interpretation of the Directive 2001/14/EC is calculated from the amortization costs related to **traffic control, maintenance, and wear and tear** elements. The variable part of the charge divided between main activities and line categories can be proposed taking into account **trainkm** – applied internationally – and the qualitative parameters specific to line sections.

## **5. Conclusions**

The schedule of the introduction of the charges for the use of railway infrastructure can be seen in Appendix 3.

Parallel to the implementation of the infrastructure charging system new bodies will be formed. Requests for capacity, allocation of capacity and train paths will be handled by an allocating body independent of the RUs. Development of the charging system, and the calculation of the infrastructure charges will be carried out either within the frames of this body or by a charging unit set up especially for this purpose. A separate authority has to be created for issuing permissions and safety certificates for RUs. The operator may hand in its complaints concerning the allocation of infrastructure capacity and the charging system to the authority responsible for regulation and appeals.

The newly forming infrastructure capacity market may result in the railway sector operating in a more transparent way, a more efficient use of budget sources as well as a growth in competitiveness with other transport modes. In order to achieve this the present economic / controlling system needs to be adjusted in such a way that it is based on a new prime cost calculation in line with the separation of IM and RU.

Ensuring the optimal use of train paths is the task of the capacity allocating body. The infrastructure charge as a market regulating instrument enables the RUs to operate on a market basis, and thus calculating the profitability of passenger and freight transport becomes objective. The future practical application of compensatory systems for environmental, accident and infrastructure costs not covered by the transport modes will largely improve the competitiveness of the railway sector and the comparability of costs incurred at the different modes of transport.

The infrastructure charging system to be implemented helps locating bottlenecks and weak points on the infrastructure and thus justifies the decisions about rationalization, modernization, development and reduction. Harmonization of capacity allocating and charging systems, establishment of a transparent and uniform process is indispensable to achieve effective operation on an international level.

The raise of the interoperability is of capital importance on behalf of how to make the railway effective and attractive. The interoperability between the European railways is low degree. Measures, which may raise the interoperability:

- The compatibility of the locomotives – to get over the problems which come from the different electric standards
- The compatibility of the rolling stock – multifunctional/adjustable rolling stock
- Qualifications and authorization of the engine drivers
- Technical prescription of the different levels of qualification (e.g. ERTMS, European Rail Traffic Management System)
- Building up of the train control systems (ETCS, European Traffic Control System).

On behalf of the avoidance of the sub-optimal output have to be shaped the complex system of the availability charges and state supports:

- A solution has to be found for the trade-off problems between the competitiveness of the countries and railways (between transport modes) and the financial requirements
- Parallel with that different infrastructure financing methods have to be taken into consideration
- The EU financing put the importance on the Trans-European Network.

The existing cost calculation methods of the Hungarian Railways can be improved with using the marginal cost theory. However, the “pure” usage of the method is not acceptable since its barriers and practical difficulties. When constructing the new “account based marginal cost approach”, it is aimed to use all possible benefits of the marginal cost theory while eliminate its drawbacks.

The modernisation and improvement of the cost calculation and price setting methods are under development. A newly prepared PhD dissertation, titled "**Marginal Cost Based Pricing Model in the Railway Transport Sector**" (written by Peter RÓNAI) has examined the constraints and developed the mathematical-functional background of the theory and for the derivation of results for both monopolistic and competitive market circumstances.

In order to achieve a more accurate allocation of costs to each activity of the company, a new data-collection system and price-entities had to be defined. The dissertation treats the business cost functions valid for monopolistic and for competitive markets, including the price function, and assessment process of the market equilibrium.

The account based marginal cost approach does not provide the prices according to the marginal-cost theory, but it applies a certain price-function. The way to “construct” the use of this price-function, and to formalise it for mathematical treatment is written in the thesis.

Restructuring the ground-data records and the cost calculation system required the re-engineering of the business processes. An important block of the account based marginal cost approach model, as a decision support instrument, has been configured to use all the advantages. The dissertation estimated cc. 18 months for the completing of the implementation of the new method by the railway company.

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