RailCalc

Calculation of charges for the Use of Railway Infrastructure

THE RAILCALC PROJECT
OVERVIEW & RESULTS

Paulo Teixeira - CENIT

RAILCALC WORKSHOP
Brussels, February 15th, 2008
Team

European Commission:

DG Energy and Transport
Unit TREN E2

RailCalc Consortium:

CENIT, Center for Innovation in Transport;
(Coordinator)

TIS.PT, Consultores em Transportes,
Inovação e Sistemas

IWW, Institut für Wirtschaftspolitik und
Wirtschaftsforschung

Herry Consult GmbH
Objectives

• To analyse the estimate of **infrastructure charges** in the Member States (basic charges, mark-ups, performance schemes, reservation charges, scarcity charges, discounts,...)

• To develop a **best practice guide** to set and verify compliance of rail infrastructure charges with the rules of **Directive 2001/14/EC** in close collaboration with rail infrastructure managers, national regulatory bodies and the European Commission.

• To provide a **road map** for infrastructure managers to shift to accounting systems meeting the requirements and general objectives of EC directives.

Scope

• **32 countries**: the present EU-27 Member States, except Cyprus and Malta, plus Switzerland and the West Balkans
Structure

3 PHASES APPROACH

Diagnostic
Proposal
Implementation

PHASE A: CURRENT PRACTICES ANALYSIS
WP 1: Inventory
WP 2: Inventory analysis
WP 4: Current practice assessment

PHASE B: BEST PRACTICES PROPOSAL
WP 3: State of the art and evaluation framework
WP 5: Best practice on cost structure
WP 6: Best practice on charging calculation

PHASE C: BEST PRACTICES IMPLEMENTATION
WP 7: Road map for best practice implementation

CENIT Center for Innovation in Transport
UNIVERSITAT POLITÈCNICA DE CATALUNYA

Brussels, 15th February 2008
State of advancement

START: October 2006
Submitted September 2007
Final draft (Validation pendant)
Ongoing
END: March 2008

PHASE A: CURRENT PRACTICES ANALYSIS
- WP 1: Inventory
- WP 2: Inventory analysis
- WP 4: Current practice assessment

PHASE B: BEST PRACTICES PROPOSAL
- WP 5: Best practice on cost structure
- Validation process
- WP 6: Best practice on charging calculation

PHASE C: BEST PRACTICES IMPLEMENTATION
- WP 7: Road map for best practice implementation

WP 3: State of the art and evaluation framework
Contents

OVERVIEW AND RESULTS

PHASE A - DIAGNOSTIC

• Current practices inventory
• Current practices analysis
• Reference framework
• Assessment methodology
• Alignment with Directive 2001/14/EC
• Open assessment
Data collection

Inventory
- 21 annual reports (2005)
- 26 network statements (val. 2007)
- Other published information (Previous research projects e.g. RAILIMPLEMENT, TREND, FARU, SERVRAIL, national legislation ...)

Interaction with stakeholders
- 5 phone interviews
- 8 question lists

Questionnaire
Charging practices
- 21/32 = 66% answers
- 21/26 = 80% of NS

Accounting practices
- 20/32 = 62% answers

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Current practices inventory (2)

E.g. **Questionnaire on charging practice** - 27 questions in five blocks

- Charging principles
- Mark-ups
- Congestion and scarcity charges
- Performance schemes
- Discounts

<table>
<thead>
<tr>
<th>Does your entity consider any of the following charging schemes?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does your entity consider any of the following charging schemes?</td>
</tr>
<tr>
<td>If applying any of the charging schemes based on marginal costs, how does your entity estimate its marginal costs?</td>
</tr>
<tr>
<td>How does your entity allocate mark-ups through the charging scheme?</td>
</tr>
<tr>
<td>Does your entity consider any performance regime?</td>
</tr>
<tr>
<td>Does your entity consider any discount in its charging practice?</td>
</tr>
</tbody>
</table>

- 1 - Yes 43%
- 2 - No 57%

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Current practices analysis (1)

Charging concepts

- Basic charge - Cost of use of assets
- Environmental charge
- Track charge
- Emission charge
- Accident charge
- Special charge for passenger traffic
- Special charge for crossing section X

Mark-ups
- Reservation
- Mark-up
- Mark-up

Performance schemes
- Discounts
- Network Statement

E.g. 1)
**Current practices analysis (2)**

E.g.

<table>
<thead>
<tr>
<th>CUA -01</th>
<th>CUA -02</th>
<th>CUA -03</th>
<th>CUA -04</th>
<th>......</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marginal costs</td>
<td>Marginal costs</td>
<td>Marginal costs</td>
<td>Marginal costs</td>
<td>Marginal costs</td>
</tr>
<tr>
<td>Maintenance costs</td>
<td>Operation costs</td>
<td>Operation, maintenance &amp; renewal costs</td>
<td>Operation, maintenance &amp; renewal costs</td>
<td></td>
</tr>
<tr>
<td>Gross ton-km</td>
<td>Train-km</td>
<td>Gross ton-km</td>
<td>Veh-km</td>
<td></td>
</tr>
<tr>
<td>Non differentiated</td>
<td>Non differentiated</td>
<td>Type of service</td>
<td>Type of vehicle</td>
<td></td>
</tr>
</tbody>
</table>

These are the practices that will be assessed later on!
## Current practices analysis (3)

**E.g.**

<table>
<thead>
<tr>
<th>Mark - ups (9)</th>
<th>MUP-01</th>
<th>MUP-02 ...</th>
<th>MUP-05 ...</th>
<th>MUP-08</th>
<th>......</th>
</tr>
</thead>
<tbody>
<tr>
<td>New infra costs</td>
<td>New infra costs</td>
<td>Fixed costs</td>
<td>Part of fixed infra costs</td>
<td>......</td>
<td>......</td>
</tr>
<tr>
<td>All services (type of service)</td>
<td>All services (Non differentiated)</td>
<td>Pass. services (Geographical areas, traffic)</td>
<td>All services (type of service, line category, time band)</td>
<td>......</td>
<td>......</td>
</tr>
<tr>
<td>Modelling WTP</td>
<td>---</td>
<td>WTP through franchising procedure</td>
<td>---</td>
<td>.....</td>
<td>.....</td>
</tr>
<tr>
<td>Levied in new section</td>
<td>Levied in new section</td>
<td>Levied in all network</td>
<td>Levied in all network</td>
<td>......</td>
<td>......</td>
</tr>
<tr>
<td>Train-km</td>
<td>Gross ton-km</td>
<td>Fixed amount</td>
<td>Train-km</td>
<td>......</td>
<td>......</td>
</tr>
</tbody>
</table>
Current practices analysis (4)

E.g. Environmental
- Charges / Compensation
- Noise / Air pollution / Accidents
- Type of service / traction

Discounts
- New link of the network
- Infrastructure backwardness
- Maintenance vehicles / single loc./empty passenger cars/…
- Exceptional events / duration of contracts /..

Reservation
- Administrative / other costs
- Per request / per train-path / per path-km

Performance schemes
- To some RU / to all services
- Based on delay minutes / based on a % of refund money to customers for delays
- Fixed price / secondary delays issues

Congestion
- Variations according to time / speed deviation (fixed speed or regarding allocated train path)
- Types of services
Evaluation framework

**State of the art**

- EU legislation
- Accounting (Valuation of assets, standards)
- Charging methods
- Regulation
- Framework contracts
- Other modes

**Evaluation framework**

- **Legal framework** --> Directive 2001/14/EC
  - Objectives
  - Requirements

- **Reference framework** ‡ Future oriented
  - Commercial orientation of railway business (financial equilibrium)
  - Avoid Discrimination of market participants (international traffic)
  - Need for enhanced cost modelling techniques able to estimate charges based on present and future costs (ABLCC)
  - Multiple requests on the accounting systems (management, setting charges, regulation)
Assessment methodology

1) **Alignment with current legal framework (Directive 2001/14/EC)**

Charging practices have been analysed according to 2 axis:

- **Objectives** (Preamble)
- **Requirements** (Section II)

Quantitative figure of the degree of alignment with Directive 2001/14/EC

2) **Open assessment (SWOT analysis)**

Charging and Accounting practices have been analysed according to the defined

**Future oriented Reference Framework**

Qualitative figure as discussion elements (for Phase B)
## Alignment with Directive 2001/14/EC (1)

### Criteria

<table>
<thead>
<tr>
<th>Recital N°4</th>
<th>Statement</th>
<th>Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>(11)</td>
<td>(...) Charging schemes should attempt as far as possible to meet the needs of all users and traffic types in a fair and non-discriminatory manner.</td>
<td>Fairness (intramodal)</td>
</tr>
</tbody>
</table>

- **Fairness (intramodal):** Charging practices will be considered aligned with this objective if they apply in a proportionate way to different services. Proportionality is to be established with respect to each charging concept (e.g. for performance schemes - delay causation, etc.).

### Practice Objectives

- **PER**
  - Non-discriminatory access
  - Fairness (intramodal)
  - Incentives to operational efficiency (PER)

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Alignment with Directive 2001/14/EC (2)

Output

8 Synthesis tables

<table>
<thead>
<tr>
<th>PER</th>
<th>00</th>
<th>01</th>
<th>02</th>
<th>03</th>
<th>04</th>
<th>05</th>
<th>06</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non discriminatory access</td>
<td>n/a</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Fairness (intramodal)</td>
<td>n/a</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Incentives to operational efficiency (PER)</td>
<td>n/a</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>?</td>
<td></td>
</tr>
<tr>
<td>Non discriminatory charges for different RU</td>
<td>n/a</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Equivalent charges for equivalent uses and services</td>
<td>n/a</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>?</td>
</tr>
<tr>
<td>Implementation of a performance scheme (PER)</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Improvement of operational performance of the network (PER)</td>
<td>n/a</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>?</td>
</tr>
<tr>
<td>Uniformity of the performance scheme (PER)</td>
<td>n/a</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>?</td>
</tr>
</tbody>
</table>

Relative evaluation of the degree of alignment

More aligned
Alignment with Directive 2001/14/EC (3)

**E.g.**

**TABLE 21** Assessment according to legislative framework. Asset related charges

<table>
<thead>
<tr>
<th>CUA</th>
<th>01</th>
<th>02</th>
<th>03</th>
<th>04</th>
<th>05</th>
<th>06</th>
<th>07</th>
<th>08</th>
<th>09</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic efficiency</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Non-discriminatory access</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Uniformity of charging principles</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Non discriminatory charges for different RU</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Marginal cost approach</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Relation between charges and costs attributable to infra services</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
</tbody>
</table>

*Practices codes indicated in §5.1; (+) Positive assessment; (-) Negative assessment*

**Charges related to the cost of use of assets**

**CUA-04:** Charges recovering operation, maintenance and renewal marginal costs per vehicle-km according to the vehicle characteristics.
### 4 Objectives

<table>
<thead>
<tr>
<th>CUA</th>
<th>01</th>
<th>02</th>
<th>03</th>
<th>04</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic efficiency</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Non-discriminatory access</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Incentives to cost efficiency</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Cost-relatedness (CUA)</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Differentiation according to specificities</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

### 4 Requirements

- : No Infrastructure related variables
- : Uniformity of charging principles
+ : Non discriminatory charges for different RU
+ : Marginal cost approach
- : Relation between charges and costs attributable to infra services
+ : Marginal cost based
+ : RU are not discriminated
+ : Vehicle related variables
+ : Marginal cost based
Alignment with Directive 2001/14/EC (3)

Number of fulfilled objectives

Number of fulfilled requirements

To be further studied (phase B)

E.g.
Open assessment – Future oriented

Criteria

How do current practices perform regarding the reference framework?

Aspects related to the setting of charges
- Calculation / estimation of MC
- Allocation of costs to charges (railway services, railway infrastructure, services provided)
- Estimation of future costs / Linkage to LCC methods

Aspects related to the verification of charges
- Assessment of IM efficiency
- Establishment of comparisons with similar entities
### Open assessment (2)

#### 13 SWOT (Accounting)

Accounting units: sections over the network.

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Opportunities</th>
<th>Weaknesses</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Detailed cost knowledge</td>
<td>• Analysis of infrastruc</td>
<td>• Difficulty to define sections</td>
<td>• Potential difficulties in implementation</td>
</tr>
<tr>
<td>• Easy correlation to traffic</td>
<td>• Linkage to marginal cost</td>
<td>• Requires demanding cost information system</td>
<td>• Possible increase of administrative costs</td>
</tr>
<tr>
<td>• Easy correlation to infrastructure data</td>
<td>drivers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Easy correlation to railway services</td>
<td>• Linkage to LCC methodologies</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Evolving calculation methodology</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Not considering network specificities</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Complex calculation procedure (generally)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 72 SWOT (Charging)

CUA-04 Basic charges recovering operation, maintenance and renewal marginal costs per vehicle·km according to the vehicle characteristics.

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Opportunities</th>
<th>Weaknesses</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Based on a detailed cost calculation procedures</td>
<td>• Linkage to LCC methodologies</td>
<td>• Difficulty to define sections</td>
<td>• Possible changes over time</td>
</tr>
<tr>
<td>• Levied according to detailed vehicle cost drivers</td>
<td>• Incentive to improve rolling stock characteristics and reduce maintenance costs</td>
<td>• Requires demanding cost information system</td>
<td>• Possible cross subsidization between different types of line</td>
</tr>
<tr>
<td></td>
<td>• Incentive to a balanced distribution of services</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### PHASE A

Assessment

PHASE A
### Open assessment (3)

#### Accounting units: sections over the network.

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Detailed cost knowledge</td>
<td>• Analysis of infrastructure-based cost drivers</td>
</tr>
<tr>
<td>• Easy correlation to traffic</td>
<td>• Linkage to marginal cost estimation / calculation</td>
</tr>
<tr>
<td>• Easy correlation to infrastructure data</td>
<td>• Linkage to LCC methodologies</td>
</tr>
<tr>
<td>• Easy correlation to railway services</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weaknesses</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Difficulty to define sections</td>
<td>• Potential difficulties in implementation</td>
</tr>
<tr>
<td>• Requires demanding cost information system</td>
<td>• Possible increase of administrative costs</td>
</tr>
</tbody>
</table>
**Open assessment (4)**

**E.g.**

<table>
<thead>
<tr>
<th><strong>CUA-04</strong></th>
<th>Basic charges recovering operation, maintenance and renewal marginal costs per vehicle·km according to the vehicle characteristics.</th>
</tr>
</thead>
</table>
| **Strengths** | • Based on a detailed cost calculation procedures  
• Levied according to detailed vehicle cost drivers |
| **Opportunities** | • Linkage to LCC methodologies  
• Incentive to improve rolling stock characteristics and reduce maintenance costs  
• Incentive to a balanced distribution of services |
| **Weaknesses** | • Evolving calculation methodology  
• Not considering network specificities  
• Complex calculation procedure (generally) |
| **Threats** | • Possible changes over time  
• Possible cross subsidization between different types of line |

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Phase A results (1)

Identification of relevant practices to be **further studied**

- Basic charges (CUA) recovering marginal operation, maintenance and renewal costs, **incorporating significant cost drivers** able to reflect the contribution (to wear and tear) of different types of **rolling stock** in different types of **infrastructure**. However, such charging systems stresses the need for detailed accounting data and models able to clarify the link of costs to services.

- **Mark-ups** allocated to railway services after having **explored the WTP** of operators (through demand models or through a tendering procedure), taking into **consideration intermodal competition effects**. Both aspects should preferably be approached through variables linked to **railway services (divided into specific market segments)** and **time band**.

- **Reservation charges increasing as the departure time is approaching**. Their level should be set as a compromise between the flexibility of the operator and the planning activity of the infrastructure manager.
Phase A results (2)

Identification of relevant practices to be further studied

- **Performance schemes** applied to all services, based on the measurement of the delay minutes caused or suffered by every stakeholder.

- **Scarcity charges** applied only to sections declared congested, sufficiently differentiated per time band. Calculation procedure of WTP of different market segments for specific slots are still an open issue (auctioning?)

- **Environmental charges** reflecting external marginal costs and differentiated according to cost causation-related variables and taking into consideration the practice followed in other transport modes.

- **Discounts** intended to stimulate the use of new links of the network.
Phase A results (3)

Identification of relevant practices to be further studied

Regarding the requirements for accounting systems, the analysis according to the reference framework points out the need for a detailed cost allocation to physical (preferably section based) and organizational accounting units (preferably linked to specific activities).

From the perspective of charging, as well as regards the commercial orientation of the IM activity and the external control of its performance, the adoption of activity based costing (ABC) is of great interest.
Calculation of charges for the Use of Railway Infrastructure

Thank you for your attention!!