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**INTEGRATED PROJECT – CONTRACT N. TREN-06-FP6TR-SO7-69821**

# Retrack

**REorganization of Transport networks by advanced RAil freight Concepts**

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# 1 Introduction

The main objective of the RETRACK project is to develop, demonstrate and implement an innovative and market-tested rail freight service along an East-West trans-European corridor. This axis will be composed of a backbone corridor connecting Rotterdam with the Black Sea seaport Constanza in Romania.

While setting a rail intermodal service between the west and south-east Europe, a rail transport operator is confronted with a lot of challenges. Experience shows that it takes a lot of managerial efforts to overcome the technical, operational and institutional hindrances along the RETRACK corridor. Some of these are generic, arising from inadequacies of national rail policy enforcement, while others are corridor-specific, generated by the current lack of network interconnectivity and divergent operations standards. Work Package 9 of RETRACK uses knowledge of corridor-specific operations, and institutional and managerial conditions assessed through runs of train pilots and service provision demonstrations in corridors studied, to develop an extrapolation framework for approximating how these outcomes may apply to other trans-European corridors and fulfilment of EC's Common Railway and Economic Policy.

The CREAM project has been developed within the same sphere as RETRACK. There are however significant differences between the projects that make comparison of the projects and their services interesting. One such aspect is that the CREAM services are run by the large incumbent rail operators in the countries involved, while the RETRACK services are run by smaller private rail companies.

The objective of this deliverable is to establish an evaluation framework based on indicators that facilitate comparison of the RETRACK and CREAM corridor services in terms of:

- Degree of fulfillment of original objectives
- Type and importance of different barriers to achieving commercial success
- Contribution to reaching goals of the EU transport policy
- Experiences and content of implemented business models
- Estimated business potential for intermodal freight in examined segments and markets
- Establish collaboration relations developed for rail network and freight terminal capacity allocation

The rest of this deliverable is organised as follows. In Chapter 2, purpose and contents of evaluation based on indicators is discussed, while chapter 3 gives a brief introduction to the RETRACK and CREAM projects. Chapter 4 contains the methodological approach that will be used in the RETRACK-CREAM evaluation, whereas concluding remarks are given in Chapter 5.

## 2 Purpose and contents of evaluation

The purpose of evaluation is to demonstrate performance, discover where improvements have and/or could be made, and to identify good practice and lessons for the future.

The basic contents of evaluation may be summarised in the following six activities (inspired by Vance (2005)):

1. Formulate strategies (for instance new transport solutions) to be evaluated.

2. Identify relevant outcome indicators (economic, social, and environmental) and associated data requirements. A part of this is to identify stakeholders that are affected by the strategies.

3. Identify the time horizon of the analysis and establish *baseline* conditions (i.e. conditions under the do-nothing scenario).

4. Evaluate the scenarios identified in Step 1 by predicting the change in the outcome indicators identified in Step 2 relative to the baseline scenario.

5. Analyse the indicators in a unified framework that highlights the trade-offs inherent to the comparison of the strategies.

6. Analyse the sensitivity of the results under different assumptions of the analysis.


The role of indicators is crucial in evaluation. Indicators may however be at very different levels. In the context of urban mobility, Macário (2005) points at five different categories of indicators that would be needed in feedback evaluations:

• *Resource* indicators cover the inputs used by the system

• *Process* indicators cover the effectiveness and efficiency of the processes that are organized to transform inputs into outputs

• *Output* indicators cover the outcomes that are obtained

• *Result* indicators measure the benefits/disbenefits of any action or policy

• *Impact* indicators represent the anticipated consequences beyond the direct and indirect consequences of those who are directly affected by the system considered


Indicators have formed the basis for evaluation in a range of projects and cases, including EC-funded projects such as PROMIT, CLOSER and various CIVITAS projects.

# 3  Background on RETRACK and CREAM

Cross-border rail services such as the RETRACK and CREAM corridor services through Central and South-Eastern Europe face many challenges.

On the technical side, the corridor services run through countries with varying quality of the rail infrastructure. In many places extensive investments and upgrades are needed, and there is also a need for better maintenance of the rail lines and upgraded rolling stock. In several countries there is lack of compliance with EU standards of signaling an control systems. There is also a need for common or compatible IT systems for instance for tracking and tracing of goods. It is consequently in the current situation challenging to establish streamlined and seamless cross-border rail freight services through Central and South-Eastern Europe.

There is however also challenges at the institutional level, where differences between countries in terms of legislation, routines, customs handling, surveillance, etc complicate cross-border activities. More detailed information on such challenges may be found in deliverables from other work packages of the RETRACK project.

## 3.1  Overall project goals of the EC

The overall transport policy goals of the European Commisson is presented in the 2011 White paper on transport *Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system* (Commission of the European Communities, 2011). Among the specific policy goals are:

- Thirty per cent of road freight over 300 km should shift to other modes such as rail or waterborne transport by 2030 and more than 50 % by 2050.
- A fully functional and EU-wide multimodal TEN-T 'core network' by 2030, with a high-quality and capacity network by 2050 and a corresponding set of information services.
- Establish the framework for a European multimodal transport information, management and payment system by 2020.

The earlier White paper (Commission of the European Communities, 2001) of the European Commission was presented in 2001. Some of the goals from this paper were important factors influencing the research topics in both CREAM and RETRACK. Some important goals mentioned in the 2001 White paper were to:

- Shift the balance between modes of transport by 2010, by curbing the demand for road transport and revitalize alternative transport modes such as railways, maritime and inland waterways e.g.
- Make the transport systems more efficient and safer.

This was to be solved, by for instance to:

- Create a network of railway lines that are dedicated exclusively to goods services.
- Technical harmonization and interoperability between the systems.
- Removing the bottlenecks in the railway network.
- Completing the routes identified as the priorities for absorbing the traffic flows generated by enlargement, particularly in frontier regions, and improving access to outlying areas.

During the last decades, rail freight transport has lost market shares in Europe, while road-based freight transport has experienced a significant increase. The European Commission has put significant effort into reforms that have aimed at re-vitalisation of European rail freight

transport. The RETRACK and CREAM projects are thus components with a large set of initiatives in the sector.

## 3.2 CREAM

The CREAM-Project refers to a pan-European transport corridor of an entire length of about 3.150 km. It draws a bow between Western and Central Europe and the Balkan states towards Turkey/Greece. The mega-corridor stretches across Benelux – Germany – Austria – Italy – Hungary – Romania – Bulgaria – Serbia-Montenegro – Turkey / Greece and links most relevant highly dense industrial and rural areas.
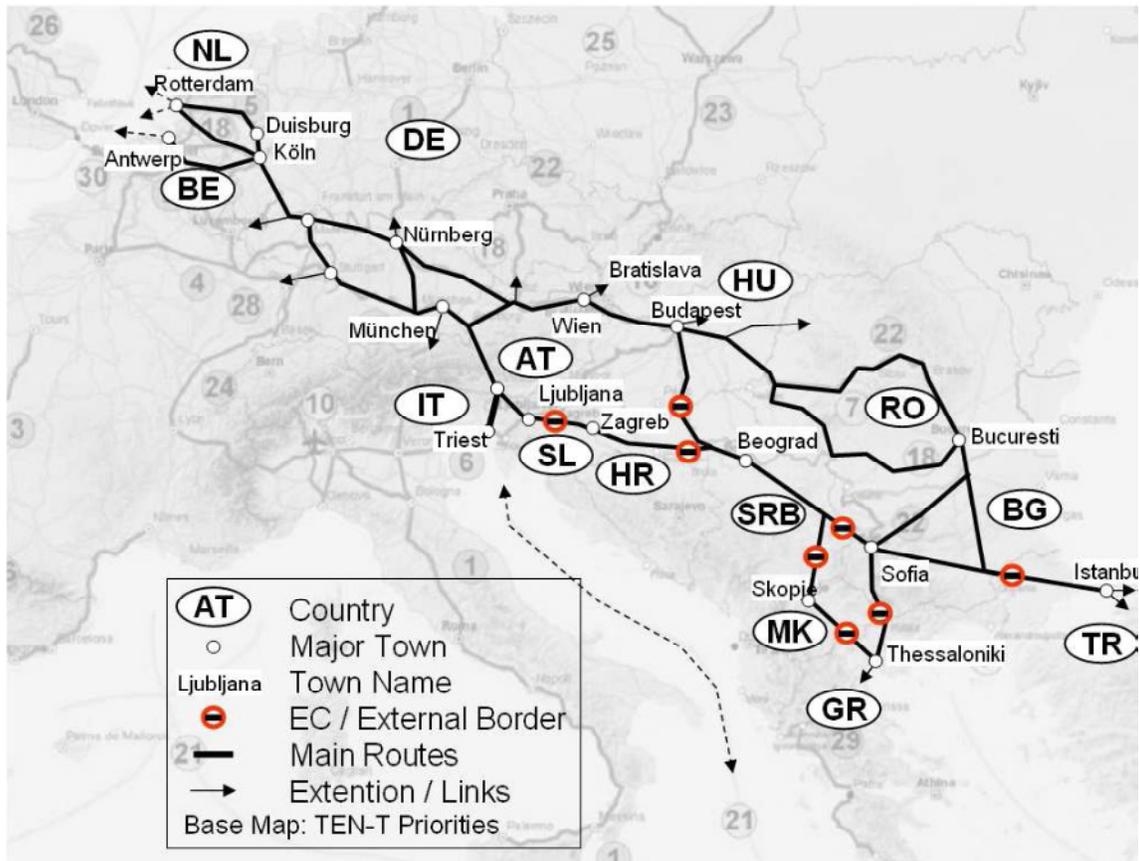


**Figure 1: Proposed CREAM corridor.**

CREAM, faces mostly the organisational challenges, which have especially on this corridor nearly the same negative effects. Some problems are related to the historic development of the railway companies which are close connected to the states and have company structures which are inflexible.

Main tasks in CREAM (2008):

- Market requirements (different commodities, market segments, port-hinterland transport, intermodal trains)
- The mechanism of cross border collaboration
- Operating procedures and agreement between infrastructure managers and railway undertakers (particularly with respect to border crossing)
- The quality of service (total transit time, punctuality, reability)
- The availability of appropriate (quantity/quality) of resources
- The lack of integration with other modes of transport.

Other tasks (CREAM 2008):

- Analyse the market requirements for typical supply chains along the corridor. Identify the potential modal shifts, requirements in terms of performance indicators such as **commodities, total transport time, need for consolidation, cost, regularity**, etc.

- Develop an advanced business model for integrated, road competive service offers which exploits the challenges set by EU legislation with respect to establishing a European Railway Area, incorporating the experiences of new entrant railways, cooperating with other mode operators and cooperation in international rail freight transport.

- Develop and implement a quality management system, including the necessary structural and process organization which ensures the monitoring of the most important quality criteria: **punctuality, reliability, information, safety and flexibility, and identification of improvement measures**.

- Implement interoperability and improved border crossing procedures. Besides organisational improvements within border stations the introduction of electronic information and communication technologies is a major aspect for *streamlining border crossing operations*.

- Develop a dual-propulsion locomotive to enable interoperable traction and close the gap of non electrified sections along the corridor

- Deploy integrated telematic solutions based on train run data from the infrastructure managers information systems and supplementing them on corridor sections – mostly in South-East Europe – by *satellite-based (GPS) tracking and tracing technology*;

- Assess particular markets, to facilitate the modal shift of the still road-dominated transports to intermodal rail-road transport.

- Summarise knowledge on how to improve "internal operations" and cooperation between neighboring European countries with respect to rail operations and the need for seamless I cross-border rail operations.

## 3.3  RETRACK

The main objective of the RETRACK project is to develop, demonstrate and implement an innovative and market-tested trans-European rail freight service along the West-East corridor linking the North Sea gateways and the Black Sea gateways with potential expansions from Rotterdam (Netherlands) to Constantza (Turkey).
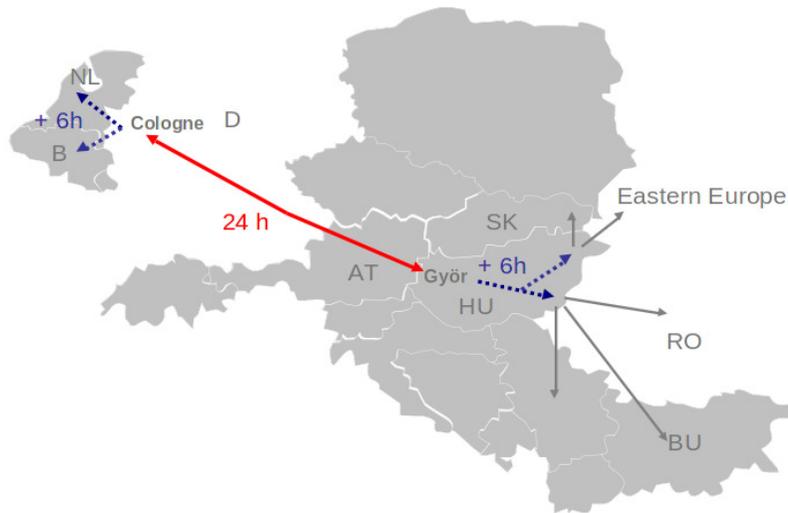
**Figure 2: RETRACK corridor.**

The RETRACK project will demonstrate how several market-driven rail operations can be integrated with strategic port hubs that provide access to large goods repositories for balanced intermodal freight transfer along the corridors studied.

Although the new railway legislation has radically changed the rail business environment, the degrees of transformation vary considerably from country to country and some political and administrative interventions for market opening and non-discriminatory treatment of new rail entrants still need to be implemented. In this connection, the RETRACK project will detect both the **opportunities and the barriers that foster/hinder seamless freight flow** along the corridors studied. Next, it will devise strategies for better exploitation of opportunities through removal of existing barriers, and propose how these measures may be used by rail entrepreneurs to develop new service concepts. Subsequently, the RETRACK team will evaluate how this corridor-driven market expansion may foster **economic growth and improve the socio-environmental conditions in industrial production regions** emerging in the newly extended Europe.

**Main objectives in the project:**
- Determining of types of barriers that obstruct the supply of competitive rail intermodal service in corridors of operations.

- Removing/circumventing existing constraints through technological innovation, efficient operations and inputs from scientific research.

- Supplying the energy-efficient competitive rail service that enhances competitiveness of transferred goods.

- Determining how the barriers hindering deployment of new operations systems for train path allocation could be tackled.

- Applying innovative rail vehicles and **cargo transfer technologies** for transfer of containers, swap bodies and trailers along the RETRACK corridors.

- Facilitating **safe transfer of cargo documentation** to all supply chain parties by employing functionalities of an ICT platform.

- Supply of high-quality rail service by deploying innovative and cost-effective rolling stock.

- Removing/circumventing existing constraints as well as facilitating opportunities related to the applied train control- and command systems throughout the corridor, including those parts covered by the new ERTMS-system.

- Applying **innovative operations planning, scheduling, and routing management techniques** for supply of high-quality rail service.

- Streamlining the rail goods flows by dealing with market-related and legislative constrains such as **working time limitations**, shortages of qualified personnel, and **traffic hindrances**.

- Devising strategies for shifting considerable goods volumes from road to the RETRACK rail corridors.

- Compressing **the noise/emissions/vibrations** and **accident occurrence** during the project's duration by transferring sizable goods volumes from road to RETRACK-served intermodal rail corridors.

- Devising business models for until 2015 market entrenchment of the RETRACK operators, and attaining a competitive level of financial profitability and returns on investments.

- Establishing a joint venture between rail operators serving the RETRACK international corridors and strategic alliances with shippers, other transport suppliers (e.g., shipping lines) and logistical intermediaries for long-term access to large goods repositories.

# 4  Methodology

Among the main features of the RETRACK and CREAM corridor services compared to the rail services offered prior to these initiatives is the focus on the needs of the market and the adaptation of services to those needs. It is therefore crucial to capture market aspects in the evaluation.

In order to transfer more goods from road to rail transport, which is one of the overall EC ambitions of the projects, it is necessary to satisfy most of the following core criteria:

- **TIME**
  *Reliability/Punctuality* (compatibility  of different traffic management systems, route management, cooperation between different infrastructure management regions, streamlining the border crossings, alternative routing if traffic hindrance, etc)
  *Total travel time* (time used in border control, and reloading, cargo transfer techniques, closeness to markets, terminal allocation, )
  *Regularity*
- **FLEXIBILITY**
  (modal shift, cargo transfer techniques, terminal management, allocation of terminals, alternative routing if traffic hindrance,)
- **MARKET**
  Adjustment to needs in the market, Access for new operators
- **ENVIRONMENT**
  *CO2ekv* (total emission (during construction, operation and maintenance
- **SAFETY/SECURITY**
  (on the track and during reloading/storing, safety of information (IT systems – operation systems), safety certification, possible outcomes of accidents with HazeMat (number of people affected),
- **BENEFIT**
  (Possible economic development locally due to the new line, market potential of the different routes)
- **COSTS**
  (investment, maintenance, and freight cost for the potential clients, , )
- **INFORMATION**
  (accessibility and security of information, IT tracking, eg)
- **TOTAL FEASIBILITY**
  *Possibility to streamline the system* ( including directing services towards countries that show an interest in cooperation and adaptation of national systems to common standards)

The criteria/indicators listed represent both the overall EC goals of the projects, as well as the most critical targets of the two individual projects. It would be advantageous with a common operationalisation of indicators in the two projects, to see how the different services and corridors score on each criteria. It will then also be possible to analyse to which degree each of the two corridor services has succeeded in reaching their targets that have been defined. A further operationalisation of the indicators is presented in Annex 1.

The comparative evaluation of CREAM and RETRACK will be conducted in two stages.

## 4.1  Stage 1 - Indicators

In the first stage, data on the effects of the corridor services will be collected by use of the criteria above and the belonging indicators (a further operationalisation of these indicators is presented by examples in Annex I).

Past Work Packages of RETRACK have already collected information and addressed some of the indicators that have to be quantified. Most likely it will not be possible to find data for all the indicators mentioned above for both RETRACK and CREAM, and certainly not as comprehensive as indicated in Annex 1. One of the goals in stage 1 is to review to which degree the information is available. In the cases where information is not available, reasons for this have to be explored.

## 4.2 Stage 2 - Interviews

The second stage will be based on a set of qualitative interviews of participants within the CREAM and RETRACK projects and stakeholders that have been affected by the corridor services of these projects. Representatives from different countries and different stakeholder groups will be approached. The interviews will be based on information that has been collected during the first stage of the comparative evaluation. The interviews will among others include questions related to:

- What have been the main barriers related to the establishment of the corridor services? How were problems resolved? If problems have not been solved, why is that and what would be needed?
- What was successful – and why?
- What was unsuccessful – and why?
- Why was the RETRACK project not able to establish a service in the full initially planned corridor?
- In your view, what is the mean learning from the project?
- Did conflicts of interest arise? How were they resolved? If such conflicts have not been solved, why is that and what would be needed?
- Was it difficult to obtain interest for the service from the market?
- What would be needed to run the whole corridor in a streamlined seamless way?

The questions will be further developed and detailed when the first stage has been completed and will be supported by a guide for the interviews.

# 5  Concluding remarks

The main objective of the RETRACK project is to develop, demonstrate and implement an innovative and market-tested rail freight service along an East-West trans-European corridor. This axis will be composed of a backbone corridor connecting Rotterdam with the Black Sea seaport Constanza in Romania.

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The comparative evaluation of CREAM and RETRACK will be performed in two stages, the first stage focusing on information collection and organisation through the use of indicators, while the second stage will perform a set of qualitative interviews for understanding and clarification of successes, failures, and explanations for these.

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# Appendix 1 – Framework for evaluation (Stage 1)

| Main criteria | Subcategory | Description | Indicator |
|---|---|---|---|
| **TIME** <br> **Reliability/punctuality / regularity/ total travel time** | Legal/political | • National vs EU standard <br> • Speed limits <br> • Custom regulations <br> • Train path allocation <br> • Terminal allocation | Speed limits, urban vs non urban areas (km/h) <br> Compability of national and EU regulations (scale 1-5) <br> Adequate allocation of the terminals, compare to market needs (scale 1-5) |
| | Institutional | • Time in border control <br> • Cooperation between the neighbouring countries <br> • Management and utilisation of rolling stock | Average speed (km/h) <br> Average delay time train (minutes/%)) <br> Average delay time shipments (minutes/%)) <br> On time delivery/delays (%) <br> Number of cancellations (per week/month/year) <br> Main reasons for cancellations <br> Average time (hours/minutes) each train spend in border control (first border, during journey, end of journey) |
| | Technical | • Capability of traffic management systems <br> • Alternative routing when traffic hindrance <br> • Old equipment <br> • Technical systems for loading/reloading <br> • Capacity of track/terminal ( numbers of vehicle, length/height/width) | Numbers of rerouting <br> Numbers of delays/cancelations due to breakdown of "equipment" (trains, signal system, track) |
| | Market | • Accessibility to market/production sites <br> • Type of goods <br> • Transit time door to door | Number of customer cancellations (pr week/month/year) <br> Numbers of complaints of delays (pr week/month/year) <br> Number of potential new clients stating that the scheduled delivery time was the reason for not choosing rail |
| | Other | • Punctuality <br> • Cancellations <br> • Identification of bottlenecks | Numbers of delays/cancelations due to shortage of workforce |
| **FLEXIBILITY** | Legal/political | • Terminal allocation | Adequate allocation of the terminals, compared to market needs |

| Main criteria | Subcategory | Description | Indicator |
|---|---|---|---|
| | | | (scale 1-5) |
| | Institutional | • Possible of rerouting when traffic hindrances<br>• Possibility for modal shifts<br>• Management and utilisation of rolling stock | |
| | Technical | • Technical systems for loading/reloading | Existing systems adequacy in handling the loading/realoding (scale 1-5) |
| | Market | • Market diversity<br>• Terminals placing compared to alternative marked<br>• Possibility to accommodate requests on short notice | % of short time requests accommodated<br>Ease of access to train service (scale 1-5)<br>Number of customer cancellations (pr week/month/year)<br>Cause for the cancellation |
| | Other | • Frequency of service<br>• Shipment compatibility<br>• Demand characteristics<br>• Availability of wagons | Departures per week |
| SAFETY/SECURITY | Legal/political | • Different safety/security regulations<br>• Working time regulations | |
| | Institutional | • Licensing of contractors/drivers<br>• Safety/security of lines, bridges, tunnels, terminals and traffic management<br>• Training of personnel<br>• Control of working time<br>• Response to accidents/threats<br>• Surveillance<br>• Information network, intelligence network | % of operation with necessary licensing<br>% of employees with necessary training<br>Response time in case of accidents/threats (minutes)<br>% of terminals with efficient/secure access control<br>% of terminals with "adequate" surveillance |
| | Technical | • Standards of lines/bridges/equipment<br>• System for tracking cargo across borders safely<br>• Signal system<br>• Traffic management | Numbers of systems failings (pr countries per year)<br>Can a specific cargo be traced, at any given time (yes no)<br>How difficult is it for outsiders to gain information about a given cargo (scale 1-5) |

| Main criteria | Subcategory | Description | Indicator |
|---|---|---|---|
| | | | Numbers of systems failures (per month or year) |
| | Market | • Loss/damages | Loss or damages (% and Euro) |
| | Other | • Transport of dangerous goods<br>• Language<br>• Accidents/ incidents | % of dangerous goods<br>Number of accidents/fatalities/injured (per year)<br>Saves lives due to modal shift (per year)<br>Number of incidents (per year) |
| **ENVIRONMENT** | | | |
| | | • Emission of CO2e, SO2, PM and NOx<br>• Noise and vibration<br>• Loss of biodiversity<br>• Conflicted  land use<br>• Water and soil contamination<br>• Energy consumption | Emission during building (CO2e, SO2, PM, NOx -tonn per country/town)<br>Emission during normal operation (CO2e, SO2, PM, NOx -tonn pr country/town)<br>Emission saved due to modal shifts (tonn)<br>Number of people exposed to noise level exceeding limit values (before and after).  $L_{den}$ and $L_{night}$<br>Number of people exposed to vibration levels exceeding limit values (before and after). Average and max vibration.<br>Energy consumption (kWh or liters per train pr year)<br>Train productivity (tonnkm per kWh)<br>Number of lost or endangered species/habitats. |
| **MARKET** | | | |
| | | • Market interest in the product?<br>• Any restriction as to which goods to transport?(size, type, where and when)<br>• Possibilities to adjust to what the client needs? Handling last minute changes?<br>• Needs and willingness to change?<br>• Booking services | How easy have it been to gain new clients (scale 1-5)<br>Type of goods ideal for rail transport (general description)<br>Type of goods not suitable for rail transport (general description)<br>% of short time requests accommodated<br>Price for costumers (EURO/tonnkm) compared to road transport, door to door service<br>Are the booking system user-friendly? (scale 1-5) |
| **BENEFITS** | | | |

| Main criteria | Subcategory | Description | Indicator |
|---|---|---|---|
| | | • Economic growth along the corridor<br>• New jobs | |
| **COSTS** | | | |
| | | • Operating costs<br>• Cost of investments<br>• Cost of maintenance<br>• Costs for consumers<br>• Congestion costs and savings | Costs of investment (equipment, new terminals/lines) per country (EURO)<br>Costs of maintaining (equipment, new terminals/lines) per country (EURO)<br>Costs of daily operation (equipment, new terminals/lines) per country (EURO)<br>Price for costumers (EURO/tonnkm) |
| **INFORMATION** | | | |
| | | • Information promptness<br>• Possibility of tracking shipment<br>• Information system availability<br>• User satisfaction with information systems<br>• Cooperation between different management regions (nationally/internationally) | User satisfaction with information system (scale 1-5)<br>Costumer satisfaction with received information (scale 1-5) |
| **TOTAL FESIBILITY** | | | |
| | | • Possibility to streamline the whole route<br>• National and institutional interest in the project<br>• Availability of financial resources<br>• Demand/interest in the market for using the new line/switching from road delivery to railway | Grade the streamlineliness of the system (scale 1-5)<br>National interest in implementing the project (scale 1-5)<br>Institutional interest in implementing the project (scale 1-5)<br>To what degree have potential clients shown interest in changing from road to rail transport of their products (scale 1-5) |