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Background Paper Containing :

- Synopsis of European Rail Infrastructure Masterplan (ERIM)
- Executive Summary of European rail Infrastructure Masterplan
- Executive Summary of Terminal Management (TEMA)

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ERIM (European Rail Infrastructure Masterplan) : Synopsis

The ERIM Project is a high-level infrastructure supply side overview of major international rail corridors, mainly for freight, within and between 32 countries. The ERIM network information covers about 50 000 route-kms of railway, which is recorded in a Geographical Information System as interconnected segments of routes, enabling specific corridors to be defined to suit particular business or political configurations.

Based on the current and the planned 2020 infrastructure provision, the ERIM Project has proposed minimum **upgrading targets** for the existing and new installations, which are in line with existing international inter-government agreements on rail tranport, so as to harmonise the main infrastructure parameters and to optimise the infrastructure offer.

In order to analyse whether the planned 2020 infrastructure provision is sufficient to carry the future traffic volumes UIC has estimated, in collaboration with its Member Railways, the **potential traffic growth** by 2020, which is in broad concordance with major European studies on rail market demand. In so doing, the ERIM Project has examined the **potential capacity utilisation**, section by section, and assessed that about one third of the ERIM network may face capacity constraints to meet the foreseeable traffic and business needs in 2020.

These ERIM findings have been widely discussed in the railway community when the previous ERIM 2005 and 2006 progress reports were published. Today they have reached a certain consensus and have been updated to take account of the latest information in this final 2007 report, whilst the underlying conclusions still remain the same.

In this 2007 Final Report, the ERIM Project has also provide some perspective on the **investment needs** to upgrade the existing infrastructure in accordance with the targets defined in ERIM and to relieve the potential route capacity constraints within the entire ERIM network, in general, and along the ERMTS corridors in particular. These identified investments should be considered in conjunction with the national **investment plans** and other necessary **complementary rail investment** in large nodes, terminals and ports in order to quantify the **potential investment gap** beyond that currently planned.

The ultimate objective of the ERIM Project is to make a contribution to a structured and appropriately funded European investment policy in the rail mode based on an integrated European Rail Infrastructure Masterplan. It acknowledges that optimum utilisation must be made of the existing network, but also underlines the importance of a Masterplan, as a means of galvanising consensus and commitment of all rail stakeholders. This should lead to an optimum level of infrastructure upgrading which will serve the business needs efficiently in 2020 and beyond and ensure a sustainable environment for the European community at large.

The current and future infrastructure provision in the ERIM network will be published in a separate UIC publication in future called: **"UIC Atlas of Infrastructure in the ERIM Network".**

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ERIM (European Rail Infrastructure Masterplan) : Executive Summary

The ultimate objective of rail strategies is to improve the market performance of the rail mode. Although a high-performance infrastructure alone is not sufficient for success in the market place, it does constitute the necessary basis.

ERIM is a **high-level infrastructure supply side overview** of major international rail corridors, mainly for freight, within and between **32 countries**. These corridors represent only **21% of the total route length** in the countries covered, but carry **47% of all passengers-kms and 62% of all tonne-kms** of the 32 countries.

One of the major components of the ERIM project has been the constitution, in collaboration with its Member Railways, of a **database** which contains the inventory of the current 2007 infrastructure and the national upgrading plans along ERIM lines with the vision towards 2020.

In order to analyse the infrastructure needs in 2020, ERIM has also established, in collaboration with its Member Railways, an estimation of traffic growth by 2020. **The ERIM traffic growth forecast for the period 2006-2020 is 34% for passenger traffic and 57% for freight traffic.** These estimations are within the range of the recent European transport demand forecast studies (ASSESS, TEN STAC and TER, see page **Erreur ! Signet non défini.**) and can thus be taken as a plausible basis for the 2020 infrastructure analysis.

The ERIM project describes the most commonly observed and projected values for the main infrastructure parameters (loading gauge - train length - axle load - train load and freight speed). ERIM has proposed minimum **upgrading targets** for the entire ERIM network and higher upgrading targets for new installations or certain corridors. These targets are in close alignment with United Nations' infrastructure upgrading agreements (AGC and AGTC, see pages **Erreur ! Signet non défini.**- **Erreur ! Signet non défini.**). This consolidates further the basis upon which ERIM has built its analysis on infrastructure investment.

In order to assess the current capacity utilisation, ERIM has compared the average number of daily trains with the theoretical capacity of the corresponding line sections, both figures being provided by the respective networks. To assess the future capacity utilisation in 2020, ERIM has assumed that it will be possible to achieve a **20% improvement in load factors** (for those line sections, which are expected to grow by more than 20% by 2020). This assumption is incorporated into the calculation of the number of trains in each line section in 2020. In this way anticipated technological progress and improved operational efficiency are factored into the analysis.

ERIM has distinguished the more "heavily-utilised" line sections from the "less-utilised" by selecting the line sections displaying **70% or more of capacity utilisation** over the full day. This 70% figure has been taken as an indicative threshold to define line sections with potential capacity constraints, especially in peak periods. It appears that **32% (16 343 route kms) of the ERIM network is likely to be constrained in 2020,** even taken account of the expected productivity gains and the currently planned infrastructure investments.

During the course of 2007, ERIM Project endeavoured to identify all the railway **investment plans** up to 2020 within the ERIM network by sending a detailed questionnaire to 32 ERIM countries. Railways were asked whether they had plans to upgrade the main infrastructure parameters to the ERIM minimum or higher **upgrading** targets and what would be the approximate upgrading cost. Railways were also asked about their investment plans in general and those coinciding with identified **bottlenecks** in particular. 22 countries provided information on their investment plans and budgets and the ERIM Project used this information to estimate the approximate investment costs related to the ERIM analysis (i.e. harmonising to the ERIM minimum upgrading targets and bottleneck relief) in the remaining 10 countries, which did not respond to the investment questionnaire. A total investment need of **194 Billion Euros** has been identified for the 32 counties participating in the ERIM study. This amount of investment would cover the treatment of the capacity constrained sections by 2020 (16,343 route–km) identified in the capacity analysis <u>and</u> the upgrading of a number of infrastructure parameters, at least to the minimum targets set for the ERIM network.

Whilst supporting the corridor based approach, the ERIM Project has also offered **another geographical perspective** on the network of corridors which have now developed from the work of many projects. Indeed, it has become clear that while a general consensus has been found for the ERTMS corridors and their extensions (covering 18 EU countries), the remaining parts of the ERIM network need to be connected also to an overall plan to enhance the railway business. The entire network of corridors, covering the 32 countries, may be thus be considered as **the Core European Rail Network (CERN)**

To emphasise the need to develop all areas in tandem and in coherence with a Masterplan, the ERIM Project has defined a common central area which forms a **kernel into which separate rail links connect from different peripheral countries or regions**. The central area has much more in common in terms of interconnected routes than the surrounding links which have regional characteristics that allow them to be studied individually. Viewing the European rail space in this way, one can retain the corridor dimension while catering for regional specifics and business plans.

The ERIM Project emphasises the need to have a coordinated **global strategy** for the central area and connecting links which will allow the key actors (such as ports, economic areas, hubs, shippers etc.) and end-customers to develop their business orientations and their investment plans with a degree of certitude as to rail's global intentions for infrastructure development in the **CERN**. This global strategy needs to review the optimal investment mix and productivity measures which can be recommended within the framework of balanced business plan that quantifies expected revenues and costs of the projected traffic on one hand, and the cost of the necessary infrastructure investment to realise this traffic on another hand. This will ensure that the **optimum benefits will arise from the available funding** (public and private).

It has to be emphasized here that national policies and wider political considerations can also shape the investment priorities. In this context, the **sustainability benefits** of rail transport, which have broader implications for the global environment, should be fully recognised and factored into the railway revenue stream. The ERIM database can provide a basis to assess the impact of taking sustainability benefits into consideration in the operating result.

To conclude, it is important to be aware that the upgrading plans of individual Infrastructure Managers will be strongly influenced by the expressed strategies of their neighbouring countries and of those Railway Undertakings who will operate on their networks. One of the main ERIM objectives has been to **provide all actors with the arguments to support decision-making in infrastructure investments and to help them to move in the same direction toward the achievement of a realistic Masterplan which will produce a virtuous circle of a sustainable rail business and global environment.**

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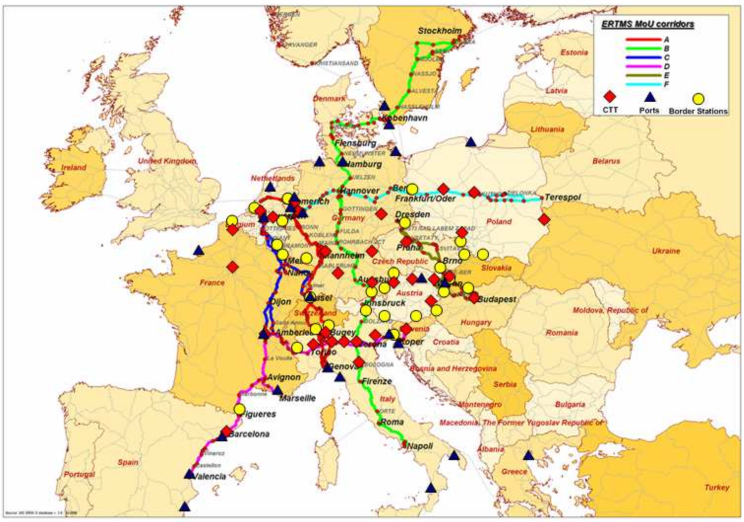
TEMA (Terminal Management) : Executive Summary

1 Introduction

The UIC **ERIM** study has estimated that average annual growth for rail freight will be around 3%-3,5% up to 2020 on the major European rail freight corridors. Another UIC study, **DIOMIS** has established that Combined Transport has been and will continue to be the most dynamic segment within the rail freight traffic: In 2005, the total combined transport traffic by rail accounted for 125 million tons, corresponding to 12,7 million TEUs[1] . About 56% of this volume was transported in maritime containers from sea ports to the hinterland and 44% in continental movements (domestic or international) between inland combined transport terminals. The annual growth is estimated to be 8% for container hinterland traffic and 6% for domestic continental and almost 9% for international continental traffic.

Whereas Diomis has established the best practises for more efficient use of existing infrastructure along the corridors and in CT terminals, ERIM study has estimated the future capacity needs along the corridors to carry the forecast traffic. Whilst the aforementioned studies are complementary, **TEMA** was commissioned to complete them with analysis on the **infrastructure capacity on nodes** and on the so-called **last mile**, the link connecting the CT terminals to the main line. For the analysis TEMA selected the following sample of nodes with regards to the existing or potential demand for international combined transport and in connection to the main freight corridors and / or to the central European transport area:

- 53 maritime port CT terminals
- 10 inland waterway port CT terminals
- 57 inland CT terminals and
- 34 border stations



[1] TEU = Twenty foot Equivalent Unit.

TEMA has proposed a **method** to assess the infrastructure capacity in CT terminals and border stations and has established a broad overview of the current and future **capacity utilisation** in these nodes. The main emphasis was given to the CT terminals because the capacity in border stations appeared to be less critical as the track occupation time has substantially diminished due to increased interoperability, especially in Western Europe. TEMA also developed a set of recommendations for the planning and management of the last mile operations by taking into account the detailed examination of 16 terminals across Europe chosen as **case studies**.

2 Capacity and traffic in CT terminals

The TEMA CT terminal selection covers approximately 80% of the total European combine traffic by rail[2]. Their total throughput was about 9 million Loading Units (LU) / year and as 2 handled LU correspond usually to 1 transported LU, this means **about 4,5 million transported LU**,(i.e. about 5,8 million TEU or 57 million tons).
Traffic appears to grow when the number of CT operators providing services to/from the terminal increase, due to a larger set of proposed CT services and increased competition, but also because the higher the traffic, the bigger the need of combined transport supply.
The key parameters for the estimated "technical" transhipment capacity within the CT-terminals are **opening time**, **total length of transhipment tracks**, and **number of handling equipment** (such as cranes), however several terminals handle more than their technical transhipment capacity, due to optimised operations.

<u>Inland terminals</u>

Currently, the CT transhipment volume for the 16 most important inland traffic areas[3] (out of 33) covers about 80% of the total handled LU (usually with rail-road transhipment). Each of these areas generates more than 160 000 LU / year. Rail-rail transhipment is increasing but it represents still less than 5% in most inland terminals. Rail–rail transfer means that the terminal plays the role of a gateway, where the LUs are interchanged from inbound to outbound trains for different directions (similarly to the "hub" concept).
Currently the highest **saturation levels** are observed in Munich and Hamburg areas. In some areas such as Duisburg, Milano or Nürnberg, additional transhipment capacity has recently been put into operation (responding to previous congestion), so the saturation level appears to be rather low.
From 2005 to 2020[4], a significant increase of CT traffics is estimated in all traffic areas, varying between 80% and 980%. The increase of transhipment capacity which is planned so far is often insufficient to handle the forecast traffic, and the **unsatisfied demand is estimated to be around 5,3 million LU in 2020**, with potentially critical situation in the Milan, Wels and Munich areas. This unbalance is partly due to the relatively short terminal investment planning horizon of 3-5 years and therefore the investment plans from 2010- 2012 up to 2020 are not decided yet. However, the conclusion remains the same, the future investment need is equivalent to an extra transhipment capacity of 5,3 million LU.

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[2] The UIC 2004 study indicated a 2002 total CT international traffic of 3,5 million TEU, and an overall ratio of 2:3 between national and international traffic, so that the total CT traffic volume can be estimated at about 5,8 million TEU. With average annual growth of 6-8 % observed in the last year, the total European CT traffic for 2005/6 can be evaluated at about 7-7,5 million TEU.

[3] Milano, Ludwigshafen-Mannheim, Koln, Wels, Verona, Praha, Munchen, Basel, Duisburg, Hamburg, Padova, Novara, Paris, Salzburg, Lyon, Wien.

[4] The estimation of the transhipment traffic volume in the year 2020 is elaborated on the basis of actual data gathered by PWC and KC about transhipment volumes (for the year 2005 or 2006) and assumptions on the country specific growth rates (from DIOMIS) .

Port-related terminals

Currently the CT transhipment volume for the 6 most important maritime traffic areas (out of 18), i.e. Hamburg, Rotterdam, Bremerhaven, Genoa, Zeebrugge and Antwerp, covers about 80% of the total volume of handled LU. Each of these areas generates more than 350 000 LU / year. The share of **rail movement** of the maritime container traffic to hinterland is very different depending on the port, with highest value in Zeebrugge, Bremerhaven, Gioia Tauro, La Spezia, and Hamburg.

Currently the saturation level appears most critical in three areas with traffic exceeding the theoretical capacity, namely Bremerhaven, Marseille and Zeebrugge.
In 2020, a significant increase of CT traffic is estimated in all traffic areas, with growth rate varying between 140% and 370% over the period 2005-2020. TEMA has estimated that 5,6 million LU corresponding to 46% of the forecast container traffic in 2020 could be unsatisfied due to the insufficient transhipment capacity. However, as explained earlier, this **additional capacity need of 5,6 million LU can be still covered by investments planned from 2010-2012 onwards.** Port areas that are estimated to require the highest increase of CT capacity are Hamburg, Zeebrugge, Rotterdam and Bremerhaven.

3 Last mile

Rail access infrastructure

In the intermodal chain, the last mile infrastructure is not the most significant capacity constraint , which appears usually in connection with the handling operations inside the terminal. In case the latter is congested, however, also the last mile infrastructure might become critical, since, for instance, trains have to wait longer before entering into the terminal, so increasing the occupation of A/D tracks. The last mile infrastructure capacity depends considerably on the access and terminal configuration and therefore there is no systematic method for assessing the last mile capacity. The most relevant characteristics (or their combination) for the last mile capacity are :

- Direct access from the main line
- Indirect access via Marchalling yard / Station / Arrival & Departure tracks.
- Rail access from one or two sides
- Electrified access

Actors

Most of inland terminals are still operated by entities having some kind of **corporate link** to the owner, whereas 45% of the maritime port-related terminals are operated by entities having no corporate link to the owner. With regard to the level of **market opening** for traction services, 64% of inland- and 55% of port-related terminals have more than 1 RU operating trains. The market opening appears larger with transport organizers since 85% of inland and 94% of port-related terminals are used by more than just 1 CT operator. Rail accesses are part of the national IM network in 76% of inland terminals and in16% of maritime port-related terminals, the later being often under the control of a local port authority.

Planning

The last mile planning concerns the **infrastructure and operational capacity allocation** between the long-distance train movement and the terminal where intermodal loading units are transhipped between rail and road. The availability of Arrival / Departure tracks allows the parking of inbound trains (if the transhipment tracks at terminal are saturated) or of outbound trains (if the long-distance train path is not available). At some terminals there is a direct access from the main line, usually in addition to the access via A/D tracks.

In almost all terminals, the network path and terminal slots (including last mile) are planned separately. TEMA recommends an integrated planning between the main line and the terminal in order to obtain a better overview of the transport chain and an optimised use of resources. However, this integration is justified only if the costs, service quality, response time and the coordination between the two ends of the transport chain are not suffering.

Management

The management of last mile infrastructure components refers to the responsibility for the **control and operation** (including investment, maintenance and repair of the rail infrastructure) **between the main line and the transhipment tracks** in the intermodal terminal. TEMA recommends a coordinated management of infrastructure, at least at local level, for an improved synchronisation and more efficient use of last mile. If the management of last mile is in the national IM's hands, the coordination should ideally be delegated to the local unit of IM.

Pricing

The pricing of infrastructure use is related to the type of ownership and management of the infrastructure components but also to the business model, i.e. the contractual buyer-seller relations between the actors.
The intermodal terminal-to-terminal transport chain involves three components of infrastructure:

- Network infrastructure for long distance path
- Last mile infrastructure (A/D and access tracks connecting main line to the terminal)
- Terminal -related infrastructure (transhipment tracks and handling facilities)

No clear "best practices" have emerged from the case studies. As a general economic rule, separate pricing of each component of infrastructure is the theoretical best approach to ensure that the customers (the RUs) understand the value of the capacity allocated at each level. This model, however, might imply higher transaction costs and implementation problems when the infrastructure components are managed separately.

4 Conclusion

The combined transport is the most dynamic transport sector having average annual growth around 6%-9% depending on the type of traffic. The container hinterland traffic is concentrated around few maritime ports having relatively high LU handling rates, whereas the continental traffic is spread between more numerous inland CT terminals each handling lower volumes of LU.
The estimated investment gap in maritime and inland CT terminals with regards the projected CT traffic in 2020 is equivalent the handling capacity of about 10 million LU. An integrated and international planning is needed to optimise the investments in each traffic area and due to the high concentration of the container hinterland traffic, the IMs should be particularly active with regard to the rail connections and facilities within the maritime ports.
A more coordinated planning and management of the main line path and terminals slots would optimise the infrastructure capacity use and fluidity of transport operations. The IMs, RUs, CTO, TO and other service providers should became more aware of the value of the capacity utilisation of each infrastructure component.