



Some approaches to reduce transport time of intermodal services: Smart rail investments

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Abstract

Rail intermodal services are an alternative to all-road services if the average transport time offered by these services is at least comparable. One of the determinants of transport time is how well actors in the transport chain cooperate. In this paper it is shown that substantial improvements in rail transport time are possible if these actors improve their cooperation substantially. This goes along with relatively moderate investments (a few million Euros per case). Such investments may then be regarded as a cost-effective alternative for (multi-billion) investments in rail infrastructure. This is particularly relevant in an era where budgets for rail infrastructure are either limited or create an additional burden for already debt-ridden countries.

Keywords: Rail freight, transport time savings, cooperation, infrastructure.

Introduction

The literature is not unanimous regarding the question as to what is *the* factor that makes one transport mode on average more attractive to shippers and/or receivers than another, but door-to-door transport time and its variability (or reliability) is in the top five of such factors (e.g., Sommar et al., 2007).

Intermodal transport is handicapped compared to road-only transport, because next to commissioning trucking services, having a rail link in the transport chain means that the specific requirements and consequences of railway operations will influence logistic and transport performances. The number of actors increases, which makes decision making more complex. It is likely that more complexity goes along with more variability in the transport time offered by a freight transport service, hence a lower reliability of departure and arrival times. Schedules for international freight trains suggest that a user can reserve a continuous international train path for a service, but what is arranged on paper, may be different from the actual practice. A rail infrastructure manager in country A may act as a One Stop Shop (OSS) for other countries. He may sell a set of successive train paths, but cannot guarantee that the path reservations in other countries

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are available at the required moment in time. National rail infrastructure managers prepare official train schedules, but local staff (in particular decentralized rail traffic controllers) frequently make their own choices (Vleugel, 2010). They determine for instance whether (delayed) national (passenger) trains receive priority over international (freight) trains. As a consequence, an international freight train may either pass swiftly, slow-down or be halted completely, either at the border or somewhere else on the network. Each delay reduces the possibility that a train arrives on time at the next (final) destination, because it is not very likely that a train that missed its time slot can or will be offered a successive free slot and/or that the time lost can be compensated by increasing the average speed beyond the allowed speed for successive track sections, especially on heavily used parts of the rail network.

Total transport time between origin and destination consists of running time and non-running time. Especially on long distances, non-running time may significantly contribute to the total transport time. Table 1 gives an example of train services that ran through the main European west-east rail corridors in 2007-2008.

Table 1: Composition of total transport time for selected O-D pairs.

Relation	Border crossings	Distance (km)	Total transport time (h)	Time share border stops (%)	Time share other stops (%)	Average rail transport speed (incl. stops) (km/h)	Average rail running speed (no stops) (km/h)
Genk-Halkali	6	3.018	100	19,8	2,6	30,2	38,9
Sofia-Thessaloniki	1	343	17	34,4	5,1	20,2	33,3
Antwerp-Pirdop	5	2.429	70	20,6	9,0	34,6	49,2
Ljubljana-München	2	440	11	5,7	7,6	40,7	46,9

Note: The train data have been made anonymous.

Source: HaCon Ingenieursgesellschaft mbH (2009).

If we consider non-running time in more detail, then we may distinguish:

- Border crossing stops: administrative, technical checks and procedures, goods-related (health, safety) checks, customs procedures (EU-borders);
- Other stops: stand-still en-route, stay and processing time at terminals.

In case of border crossings the impact of unification and network integration within the EU has become visible over time. In the western part of Europe, border crossing time is usually very modest compared to the eastern part of Europe. In the latter, crossing borders is a slower process because of reasons to be elaborated later in this paper.

Shippers depending on rail services may accept a longer transport time from rail services compared to truck-only services, if the difference is relatively stable, hence predictable, and the integral cost of using rail services are competitive with truck-only services. The situation becomes more critical if the difference in transport time is not only substantial, but also rather variable, for instance if many trains arrive one or more days later than scheduled. Shippers and receivers may then stop using rail services.

Transport time is determined by demand- and supply factors (Janssen et al., 2006; OECD, 2010):

- Demand factors refer to the way rail operators use the infrastructure.
- Supply factors relate to:

- Infrastructure characteristics, in particular the quality and density of the network(s) including bypasses and nodes/interfaces/transshipment facilities;
- Interoperability - the ability of diverse systems and organizations to work together;
- Geographical, geological and other conditions, in particular the steepness of the terrain, the density of the soil, (adverse, variable) weather and climate conditions and how infrastructure design deals with these barriers;
- Organizational, logistic and financial conditions governing cooperation between actors in the transport chain.

Depending on the weight of each factor, these factors may either reduce or increase average transport time. Specific weights may also change over time. To give an example, the success of trucking is largely determined by factors like a higher spatial density of the road network, a more flexible organization and higher customer orientation of logistic providers and truck operators as compared to railway companies and competitive pricing. On average, a market can be served faster by truck than by rail and frequently at a lower price. If however traffic intensity grows without an adequate increase in road capacity, then these advantages may be compensated by delays and growing unreliability of transport times. Shippers may be induced to (partially) use alternative transport modes if these offer better quality of service. In practice, and considering all aspects and impacts of transport, no transport mode is superior under all possible conditions. This explains why recent EU transport documents mention co-modality: “complementary and efficient use of modes in an optimal European transport system.” and “looking at each mode individually and their integration in logistics chains.” (Berry, 2007). It means “ensuring that each mode could perform that function in the transport market for which it was most efficient” (Nash, 2009).

The purpose of this paper is to compare two ways to reduce transport time by international freight trains: investments in en-route infrastructure and investments in border stations and improved international cooperation.

In this paper, we will investigate the following research questions:

1. Is it feasible to substantially reduce the average transport time of intermodal (rail/road(/short sea)) services?
2. What alternatives are there to achieve such benefits and what are their estimated costs?
3. What could be the potential gain in transport time for the whole corridor if all investment plans are carried out and the railway organisation is substantially improved?

The system and the problem

Introduction

This paper focuses on the global transport corridor, which extends from the North Sea harbours of Rotterdam and Antwerp via different rail routes through Germany, Austria, Hungary, Romania, Bulgaria, Slovenia, Croatia, Serbia, Macedonia into Turkey and Greece. It stretches over a distance of about 2.700 km. Up to twenty international intermodal services - combinations of rail, truck and short sea services - passed the

corridor in regular intervals in 2007 (HaCon Ingenieursgesellschaft mbH, 2007a). Traffic volume and frequency vary considerably in the corridor. Again in 2007, the highest number of services was 20-37 trains per direction per week for the Dusseldorf – Cologne – Frankfurt – Passau – Wels – Linz relation as well as for the Vienna – Sopron – Budapest – Belgrade relation. This global corridor connects West-, Central- and Eastern European countries with each other and Eurasia (Turkey). Improvement of the intermodal rail-road(-short sea) services has been the key reason for an EU commissioned FP6 study called CREAM (Customer-driven Rail-freight services on a European mega-corridor based on Advanced business and operating Models) in which Delft University of Technology was involved from January 2007 until December 2010.

Future competitiveness of intermodal rail

Intermodal operators are faced with major technical, organizational and operational differences between the railway systems. In the western part of the corridor, rail infrastructure is usually of a good technical quality, but there are sections where traffic intensity and traffic mix create capacity bottlenecks, hence services are frequently delayed. Gridlock is likely if traffic volumes continue to rise to levels predicted for the future (see Brughts (2009) for the Rotterdam-Genoa corridor, its western part is shared with the CREAM corridor). Traffic volumes are much lower to the east of Austria. But, there the railway infrastructure is on average quite old and there are single track sections shared with (prioritized) passenger trains. There is also outdated rolling stock and locomotives and, to make it worse, terrain conditions are unfavorable. Intermodal terminals are scarce and those available have insufficient quality and capacity. As a consequence, the number of trains that can be handled efficiently, the average train length, weight and speed are restricted there (see Appendix). Economic payload is limited, while operational costs are unattractive. In recent years, improvement of the railway infrastructure has started, because the extension of the EU towards Eastern-Europe has allowed governments in these countries to attract more funding. As a result many of them could initiate investment programs. Some of the rail operators in these countries were also able to buy new locomotives and rolling stock.

Rail infrastructure projects face many obstacles, in particular of a legal, financial and political nature. Cross border projects are particularly vulnerable in this respect, because they assume common interests, alignment of planning in two or more countries and sufficient funds for the corridor projects. These conditions frequently do not exist (at the required moment in time). Each country develops its own stretch of rail infrastructure in an isolated way. A mid-term review of the status of 92 (planned) infrastructure projects (rail and non-rail) in the EU is interesting. These projects have a total cost of Euro 32,647 bln., Euro 5,301 bln. of which is subsidized by the EU). According to this review, about 52.2 % will be finished by the end of 2013, 31.5 % will receive a conditional extension, 12 % will receive a conditional approval and a partial reduction, while 4.3 % of these projects is likely to be cancelled or substantially reduced (EC, 2010; see also Nash et al., 2009). Securing long-term financing of infrastructure projects will remain a challenging issue, keeping in mind the dim macro-, financial-economic and political situation in most European countries. Rail infrastructure is much more expensive than road infrastructure, which implies that the social benefits of rail investment projects must be at least equal or preferably higher than those of road projects, otherwise it will be difficult to find good arguments for continued large-scale

investments in rail infrastructure. In many countries railways struggle to keep their market share, both in freight and passenger transport. Transport volume by rail has increased by 17% to 452 bln tonkms, but its modal share decreased from 12.6 to 10.7 % between 1995 and 2007 in the 27 EU member states (DG TREN, 2009, p. 108). In Eastern-Europe, passenger transport by rail has always been very small compared to Western-Europe, with freight dominating rail traffic (Monsalve, 2011).

Some 80% of all freight transport takes place over relatively short distances, where railways are less well represented and have difficulty to compete with transport by truck. Truckers from Eastern-European countries offer services at dumping prices, which will sooner or later drive their Western-European competitors out the market. This may also negatively affect quality of trucking. There are also labor shortages and restrictions on working hours, which make distance trucking more difficult and expensive.

Organizational developments

In order to become more competitive and attract a higher volume of the goods categories, which are (potentially) suitable for transport by rail, bottlenecks affecting rail transport have to be removed or reduced where necessary and financially feasible. Such bottlenecks are a mix of technical and non-technical issues.

Non-technical bottlenecks involve in particular railway organization. To compete with trucking, railway companies have to offer integrated cross-border services. In recent years, major players in intermodal rail transport have done so by using the new competitive conditions offered by the vanishing protection and shielding of many national markets. What happened in Western-Europe since the 1990's is now repeated in Eastern-Europe. Former state-owned railway companies are being integrated into the service networks of financially strong(er) intermodal companies like DB Schenker and Rail Cargo Austria. They introduce new business models with integrated logistics and transport services. Up-to-date rolling stock allows a higher quality of service, a higher productivity and lower operational costs. Railway operators that want to stay independent have to find a suitable response. An interesting way is by improving cooperation with railway undertakings of similar size or scope in neighboring countries. An example is the joint venture called Cargo 10 by the railway companies of Croatia (HZ), Serbia (SJ), Slovenia (SZ) and Bosnia (ZFBH). Bulgaria and Macedonia are expected to follow, while Romania and Turkey are also regarded as natural partners (Luică, 2010).

Improved organization may be beneficial for daily operations. We will investigate this for rail border crossings and see what the benefits in terms of transport time would be.

Methodological issues

It was challenging to acquire a consistent dataset. Calculated rail investment data are favoured over estimated data, because estimating the cost of rail infrastructure is a very complex matter due to the large number of variables involved. Calculations should be taken from feasibility studies by experts with sufficient knowledge of local circumstances. Over time many proposed rail projects were not or only partially carried out, so many cost data was not valid anymore. Each renovation project may have a different scope, sometimes the whole infrastructure is overhauled, while in other cases

only specific elements are replaced. Frequently, a series of railway investments is combined into a package, which makes it not always easy to distinguish infrastructure related investments, like building additional tracks, from those in improved organisation, like replacing ICT hard- and software, staff training, etc. This holds in particular for the upgrading of border stations. Despite these difficulties, we could collect a dataset for specific sections of Corridor X.

We continue with an overview of the publicly available data of some planned and partially already realised rail investments in Corridor X. This is followed by some examples of investments in upgraded border stations. Both are then compared, followed by an evaluation.

Investments in railway infrastructure in Corridor X

Introduction

Investments in infrastructure should help to provide the conditions rail operators need to carry out rail services at the service level demanded by their customers in a safe and cost-effective way. If demand grows, more track capacity and higher average train speeds can be arranged by constructing parallel tracks, by removing specific technical bottlenecks, such as outdated train control systems or by replacing higher altitude and curvy routes by lower level and more direct connections. A higher average operational speed reduces the average transport time of freight trains.

Table 2: Corridor X with branches.

Relation	Salzburg - Ljubljana - Zagreb - Beograd - Niš - Skopje - Veles - Thessaloniki.
Branch A	Graz - Maribor - Zagreb
Branch B	Budapest - Novi Sad - Beograd
Branch C	Niš - Sofia - Plovdiv - Dimitrovgrad - Istanbul via Corridor IV
Branch D	Veles - Prilep - Bitola - Florina - Igoumenitsa

Source: INRETS (1999).

Data availability led to a focus on branches B-D. The quality of the railway infrastructure in these branches is discussed first. Then known plans to rehabilitate specific sections of these branches are briefly mentioned together with the investments required to upgrade them to a higher – usually Western European - standard. A major infrastructure project is frequently split into smaller subprojects, which are then tendered separately in order to smoothen financing, planning procedures, project planning and -management. The governments in Eastern-Europe usually have very limited own resources to fund infrastructure projects. But, there are many external funds available either directly from the EU or as development loans from investors like the European Investment Bank, the European Bank for Regional Development Bank or the Worldbank.

Corridor X has a total length of 2528,2 km. Average track quality is (sometimes far) below the West-European standard (double track, 160 km/h maximum speed). Sixty-four per cent of the corridor consists of a single track only. Ninety-two per cent of the corridor is electrified, but there are different power supply systems (3 kV and 25 kV; Technical Secretariat (2005); Vemic (2005); Markovic (2009). In border areas, electric

connections between two neighbouring networks are either incompatible or non-available. To ensure (limited) interoperability border sections are frequently operated by diesel locomotives. Their use means additional shunting, hence a longer transport time.

Gradually improvements are visible both en route and at border crossings. Investments in doubling of tracks and in renewal of obsolete signalling equipment are a sign of this. While necessary, these investments are insufficient to counteract the lack of investments for a period of more than 30 years (SEETO, 2010). Modernization of the en-route infrastructure goes along with closures of other parts of networks and a major restructuring of services, both in the domain of passenger as well as freight transport. The same process started decades ago in Western-Europe and is still not finished. In future, international links in Eastern-European countries may be very good, even high-speed services are planned, but many local services may have disappeared.

We will consider (proposed) investments in Corridor X in Hungary, Serbia, FYR Macedonia, Croatia and Greece (Table 3).

Table 3: Railway investments in Corridor X in Hungary, Serbia, Croatia, FYR Macedonia and Greece.

Country	Section	Length double track (kms)	Euro M	Planned	Completed
Hungary ¹	Budapest – Kelebia ²	159	666		2010
Serbia ³	Batajnica-Stara Pazova-Golubincin	22.5	33		2009
	Kusadak-Velika, upgrade, stations	21.9	16.4		2002-2004
	Dimitrovgrad-Bulgarian border, reconstruction of railway station	7.15	15.9		2009
	Belgrade-Sid (Nova Pazova-Stara Pazova)	15	5.5		2002-2004
FYR Macedonia ⁴	Belgrade-Subotica (Cortanovci-Petrovaradin)	15	13.4		Finished
	Upgrading works Tabanovce to Kumanovo, Nogaevci to Negotino and Miravci to Smokvica	54	20	2012	
	Tabanovci-Gevgelija (Veles-Zgropolci-Demir Kapija)	69	150	2008-2012	
Croatia ⁵	Upgrading signalling and telecommunications systems along Corridor X	37	6	2007-2009	
	Vinkovci-Tovarnik-State border, tracks and stations	38	90.9	2009-	
Greece ⁶	Athens-Thessaloniki-Greek/Bulgarian border	520+	1 bln.	2012	
	Polkastro-Eidomeni new line		95	2009-2012	

Sources:

1. CODE-TEN (2000).
2. Section at Tata to be completed after 2013 (European Commission (2010)).
3. Government of the Republik of Serbia (2010).
4. SEETO (2007); Luică (2011).
5. SAFU (2011); ISPA (2005).
6. EIB (2011).

Other railway lines in this part of Europe either do not belong to Corridor X or if they do, at the moment of writing the paper there were no investment plans for Corridor X. It is important to realise that Corridor X runs parallel to Corridor IV (Dresden-Istanbul). Part of the rail traffic in this region follows this alternative route.

Analysing the impact of the (planned) investments

We will investigate the time savings of specific railway investments using cost-benefit analysis. Our analysis is limited to a part of the corridor. To reduce complexity, we use a *ceteris paribus* clause for the rest of the corridor.

In this manner we are able to consider the implications of three scenarios more closely:

1. The current situation which can be used as a benchmark to evaluate the results of the investments mentioned in 2 and 3 below;
2. The implications of an investment in the improvement of the handling of cross-border freight trains at the stations between Sopron and Presevo;
3. The implications of an investment in the improvement of the rail infrastructure between Sopron and Presevo.

Analysis I: Hungary

The situation in Hungary

In total 431 km of rail is utilised between the Hungarian border station at Sopron and the Serbian border station at Presevo (see Table 4). We have taken the Hellenic Container Shuttle 1 (HCS1; see Appendix - Fig. 1) as a benchmark for Corridor X.

Table 4: Railway track specifications

Track	Distance	Transport speed of HCS1 freight trains
Presevo (Serbia) – Subotica (via Belgrado and Nis)	211 km	31,15 km/h
Subotica (Serbia) – Kelebia (Hun)	11 km	47,14 km/h
Kelebia (Hun) – Ferencvaros (Budapest)	159 km	37,71 km/h
Ferencvaros (Hun) – Győr (Hun)	90 km	70,09 km/h
Győr (Hun) – Sopron (Hun)	39 km	26,58 km/h

Source: HaCon Ingenieursgesellschaft mbH (2010).

The HCS1 passes the following border stations between Austria and Macedonia:

Table 5: Border stations

Track	Border station	Border Crossing Category
Sopron – Ferencvaros (Budapest)	Sopron	B
Ferencvaros – Belgrade	Kelebia, Subotica	C
Belgrade – Presevo	Presevo	C

Source: HaCon Ingenieursgesellschaft mbH (2010)

To compare the impact of upgrading investments in en route tracks with investments in border-crossing stations and organisation, a (hypothetical but realistic upgrade) scenario for the Ferencvaros-Kelebia-Subotica line will be used in which the 2008 train profile and schedule of the HCS1 train that ran between Inoi (Greece) and Mannheim (Germany) (HaCon Ingenieursgesellschaft mbH (2010) will feature. This service offered a complete set of required data.

Upgrading the Kelebia-Subotica border crossing

Coming from Presevo, a border stop at Subotica takes 2 hours and 12 minutes according to the HCS1 timetable. This is due to the following impediments (HaCon Ingenieursgesellschaft mbH (2009)):

- 1 Border stations on both sides of the border;
- 2 Custom and police controls on both sides;
- 3 Lack of line locomotives;
- 4 Change of technical systems;
- 5 Extra locomotive shuttle between the border stations (i.e. Kelebia and Subotica);
- 6 Lack of coordination between both stations (including major redundant organisational and procedural activities);
- 7 Partially non-existing and non-compatible computer and information systems.

Upgrading this C-category border station to category A should result in a reduced stopping time of 15 minutes. This means a time saving of

- 1 hour and 16 minutes regarding Kelebia (-01:16:00);
- 1 hour and 57 minutes regarding Subotica (-01:57:00).

Can these impediments be removed by upgrading the local infrastructure and simplification and coordination of activities? Serbia is not an EU member yet, so border controls are necessary, but apart from that, streamlining the security, train/shunting operations, procedures and information exchange demand relatively small investments. For instance, information exchange can be improved by buying compatible ICT systems. A locomotive pool can help to improve shunting operations etc. Based on a few recent border station upgrades, including the major works at Dimitrovgrad, we will assume that the average investment is 3-4 mln Euro per border crossing. This figure does not include costs and benefits of optimizing the local workforce.

If Serbia would become EU member and these border stations would be upgraded, then a freight train would save more than 3 hours and 13 minutes. Even in the current situation, a substantial amount of time can be saved.

Upgrading the Kelebia-Ferencvaros railway line

Recalling Table 4, the low average speed between Sopron and Győr and Budapest Kelebia and Presevo attracts attention. Given the distance covered, increasing the speed to a substantially higher level would imply a serious reduction of travel time along this part of Corridor X.

The differences in transport speed between the Austrian border and Ferencvaros (near Budapest), on the one hand, and Kelebia and the Serbian border on the other attract also attention. Increasing the transport speed to the Austrian average of around 70 km/h (66 km/h + 77,23 km/h averages to 73,06 km/h over a distance of 592 km (372 + 220 km)) is a major improvement and offers an interesting benchmark for similar projects. So far no upgrades are scheduled for the Győr-Sopron-Ebenfurth railway line. The Győr-Sopron line consists of single track and a signaling system that is different from the Austrian PZB and the Hungarian ERTMS Level 1 that is used between Győr and Ferencvaros. The 159 km long Ferencvaros-Kelebia railway line is almost finished. The average speed of freight trains on this particular track was 37,71 km/h. An alignment to

the transport speed of 70 km/h of the Ferencvaros-Györ railway line would bring about a major time saving. With modern locomotives, such a speed increase should be achievable, given that the maximum speed of this track is 100 km/h. This goes along with a time saving of 1 hour and 57 minutes (-01:57:00).

In conclusion, an increase of the transport speed from 37,71 to 70 km/h equals the time reduction achieved if the Subotica border crossing would be upgraded from category C to category A. This not only shows the impact of streamlining border-station facilities and organisation, but compared to an investment in modernisation of the railway track over long distances, it is a very cheap alternative.

Analysis II: Serbia

The situation in Serbia

The poor state of the Former Yugoslavian railway network requires billions of Euros of investments. For Serbia alone an amount of 4,611 bln. Euros is regarded as necessary in order to raise the infrastructure quality to UNECE AGC/AGTC standards for main lines (Markovic, 2009). Next to closing gaps in electrification, second tracks are needed in order to raise transport speed and to allow a decent level of reliability of transport services.

We will now discuss and compare some of the major planned investments in border stations and en route track upgrades.

Upgrading the Presevo-Tabanovci border crossing

According to the time table the HCS1 train holds 20 minutes at Presevo border station, hence only a minor time saving can be achieved here. Operational standards were already harmonized.

Concerning Tabanovci, the HCS1 train holds there for 2 hours and 10 minutes according to the time table. Here the potential for time savings is much larger. To obtain a 15 minute stop a time reduction of 1 hour and 55 minutes is needed (-01:55:00).

In practice, the actual border stop at the Serbian-FYROM border may take almost 4 hours. Besides the extra shuttle service, all operational and governmental procedures take place, alike the situation at the Kelebia-Subotica border crossing. Furthermore, the border stop at Presevo-Tabanovci almost equals the level of the total personal border crossing effort (10,6 respectively 10,5 person hours per train; HaCon Ingenieursgesellschaft mbH, 2009)), which is the highest on this part of the Corridor X part between Inio and Mannheim. In fact, streamlining the operational and governmental procedures and the elimination of the shuttle service and unnecessary shunting will bring about a massive performance improvements (and thus, considerable time saving) and a much more reliable train service (HaCon Ingenieursgesellschaft mbH, 2009).

Again, we will assume that these improvements can be made for around 4 mln Euros. Just as with the Kelebia-Subotica case, the 9 km track between Presevo and Tabanovci is merely interesting in terms of train capacity rather than transport speed. An increase in transport speed would induce a maximum time reduction of 3½ minutes (00:03:30).

Upgrading the Subotica-Presevo railway line

A vast 4,611 Billion Euros will be invested in the upgrade of the Serbian railway infrastructure. Due to the absence of detailed data about how this amount will be spent an estimated figure will be derived. Given Table 3, we can derive that the investments per kilometre are (2654 Meuro / 501 km \Rightarrow 5,3 MEuro). The distance between Nis-Dimitrovgrad is 81 km. Subtracting this investment and adding the investments of Nis-Presevo and the investments around Belgrado one finds that the estimated investment cost of upgrading this part of Corridor X is slightly above 3 billion Euro (3013 MEuro). (501 -81 = 420 km; 420 km * 5,3 = 2226 Meuro + 229 Meuro = 3013 Meuro). With an increase in transport speed of 31,15 km/h to 70 km/h the HCS1 saves almost 10 hours and 10 minutes compared to the official time table.

Conclusions and Recommendations

We started this paper by asking three questions:

1. Is it feasible to substantially reduce the average transport time of intermodal (rail/road(/short sea)) services?

Yes, this is feasible.

2. What alternatives are there to achieve such benefits and what are their estimated costs?

There are two main options: investments in en route ('main line') infrastructure and investments in renovation and reorganisation of border crossings. The scheduled or already realised rail track modernisation and/or upgrades will result in a substantial time reduction, but at a price. For freight trains better infrastructure reduces operational barriers, but their full impact can only be achieved if the involved railway companies improve their cooperation substantially. Streamlining the border crossings in Hungary and Serbia will result in less hours saved compared to investments in en route infrastructure, but investments in border crossings are just a fraction of the billion Euros investments in en route infrastructure. The track length is an important variable when it comes to the impact of railway track modernizations. Substantial time savings are only possible over substantial distances.

Our analysis shows that streamlining border crossing operations and procedures is worthwhile due to their relatively low cost and the time savings achieved.

We do not deny the necessity of large-scale investments in railway infrastructure, in particular in cases of decades of underinvestment, but like to point to the following:

The urgency of investments in en route infrastructure in cases where these have been neglected for decades, makes them inevitable from a transport efficiency and safety perspective. After a certain quality level has been reached, the question comes what to do next? Wait for a next period of degradation? In Western-Europe we have learned that regular maintenance is a key issue in asset management. This requires a culture change and reservation of sufficient budgets among the Eastern-European states.

Even after spending large amounts of money, still important bottlenecks may remain, which negatively affect railway performance. Spending relatively small amounts on the remaining number of outdated border stations is a sound investment opportunity, so streamlining border crossings should be given increased attention.

3. What could be the potential gain in transport time for the whole corridor if all investment plans are carried out and the railway organization is substantially

improved? If we combine the time gain achieved by a test train (which relied on a special organization supported by high level management agreement) with a raw estimate of the time savings due to improved infrastructure, we would not be surprised if *durable* time savings of 50% or more would be realized, substantially improving rail transport competitiveness, at least under normal market conditions.

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Appendix



Fig. 1: The international freight train services in 2007.
Source: HaCon Ingenieursgesellschaft mbH (2007b).

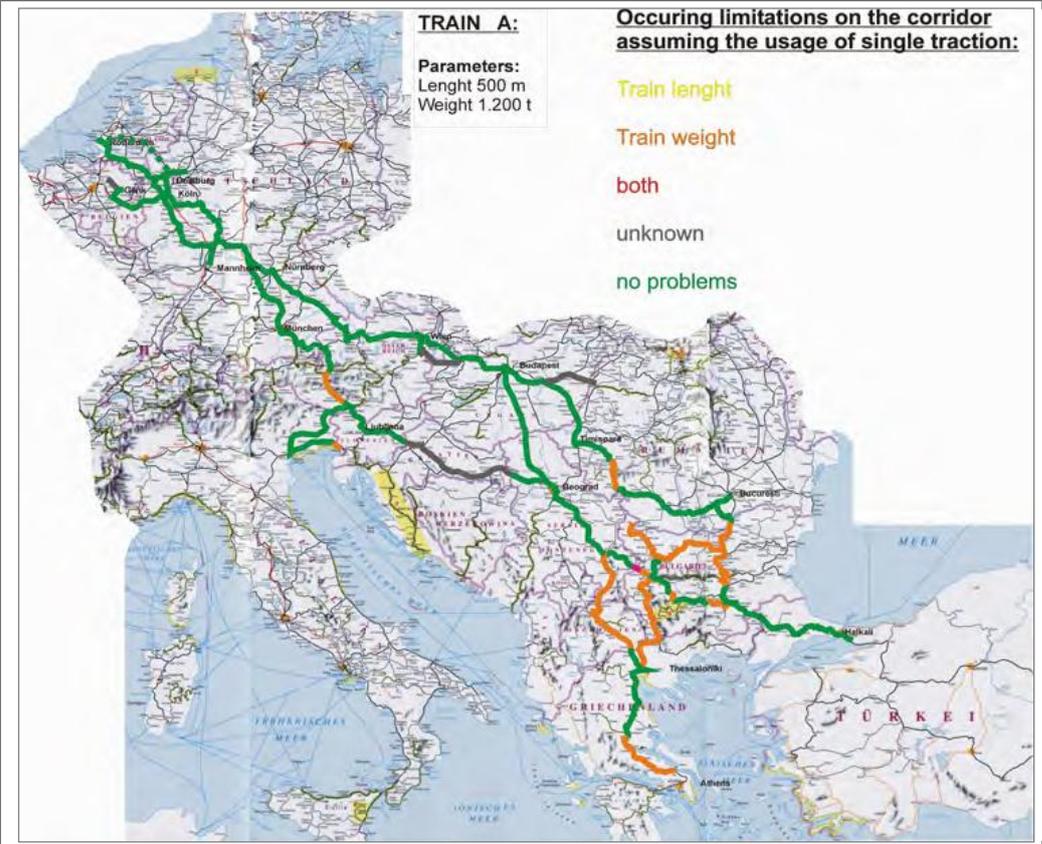


Fig. 2: Limitations for trains running in (parts of) corridor X.
Source: HaCon Ingenieursgesellschaft mbH (2007b).