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Study on introducing an intermodal (piggyback) transportation solution across the EU/CU border

Draft Final Report

June 2013
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DISCLAIMER

This report has been prepared with the financial assistance of the European Commission. The views expressed herein are those of the consultants and therefore in no way reflect the official opinion of the European Commission.

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### 1. Glossary of acronyms

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<th>Description</th>
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<tbody>
<tr>
<td>AEO</td>
<td>Authorised Economic Operator</td>
</tr>
<tr>
<td>AGTC</td>
<td>The European Agreement On Important International Combined Transport Lines And Related Installations</td>
</tr>
<tr>
<td>CCD</td>
<td>Customs Cargo Declaration</td>
</tr>
<tr>
<td>CIM</td>
<td>Uniform Rules concerning the Contract of International Carriage of Goods by Rail</td>
</tr>
<tr>
<td>CIS</td>
<td>Commonwealth of Independent States</td>
</tr>
<tr>
<td>CMR</td>
<td>Contract for the International Carriage of Goods by Road</td>
</tr>
<tr>
<td>CMT</td>
<td>Convention on International Multimodal Transport of Goods</td>
</tr>
<tr>
<td>Concept-1520</td>
<td>Concept of the organization of piggyback transportation in the area 1520</td>
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<tr>
<td>COTIF</td>
<td>Convention for International Carriage by Rail</td>
</tr>
<tr>
<td>CU</td>
<td>Customs Union</td>
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<tr>
<td>EBRD</td>
<td>European Bank for Reconstruction and Development</td>
</tr>
<tr>
<td>EC</td>
<td>European Commission</td>
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<tr>
<td>ECMT</td>
<td>European Conference of Ministers of Transport</td>
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<tr>
<td>EEA</td>
<td>European Economic Area</td>
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<tr>
<td>EIB</td>
<td>European Investment Bank</td>
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<tr>
<td>EU</td>
<td>European Union</td>
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<tr>
<td>ICT</td>
<td>Information and Communication Technology</td>
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<tr>
<td>IFI</td>
<td>International Financial Institutions</td>
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<tr>
<td>ILU</td>
<td>Intermodal Loading Unit</td>
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<tr>
<td>ISO</td>
<td>International Organization for Standardization</td>
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<tr>
<td>ISU</td>
<td>Innovativer Sattelschlepper Umschlag (Innovative Semitrailer Transhipment)</td>
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<tr>
<td>ITF</td>
<td>International Transport Forum</td>
</tr>
<tr>
<td>LKW-Maut</td>
<td>Lastkraftwagen–Maut (Heavy Goods Vehicle charge)</td>
</tr>
<tr>
<td>MAFI</td>
<td>Terminal Tractor</td>
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<tr>
<td>MoU</td>
<td>Memorandum of Understanding</td>
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<tr>
<td>MTO</td>
<td>Multimodal Transport Operator</td>
</tr>
<tr>
<td>NIB</td>
<td>Nordic Investment Bank</td>
</tr>
<tr>
<td>ND</td>
<td>Northern Dimension</td>
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<tr>
<td>NDPTL</td>
<td>Northern Dimension Partnership on Transport and Logistics</td>
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<tr>
<td>OSJD</td>
<td>Organization for Cooperation of Railways</td>
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<tr>
<td>RORO</td>
<td>Roll-on Roll-off</td>
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<tr>
<td>RZD</td>
<td>Russian Railways</td>
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<tr>
<td>SDR</td>
<td>Special Drawing Rights</td>
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<tr>
<td>SMGS</td>
<td>Agreement on International Goods Transport by Rail</td>
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<tr>
<td>TEN-T</td>
<td>Trans European Transport Network</td>
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<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>TIR</td>
<td>Transport International de Marchandises par la Route (International Goods Transport by Road)</td>
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<tr>
<td>ToR</td>
<td>Terms of Reference</td>
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<tr>
<td>UIRR</td>
<td>International Union for Road-Rail combined transport</td>
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<tr>
<td>UN ECE</td>
<td>United Nations Economic Commission for Europe</td>
</tr>
<tr>
<td>VR</td>
<td>Finnish Railways</td>
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<td>WB</td>
<td>World Bank</td>
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2. Introduction

This report is the result of a study project on introducing an intermodal (piggyback) transportation solution across the EU/CU border, which was commissioned by Northern Dimension Partnership for Transport and Logistics (NDPTL) and contracted by the EU Delegation to Russia.

The Northern Dimension (ND) is a common initiative of the EU, Russia, Norway and Iceland, with Belarus also playing an increasingly important role in the cooperation. The Northern Dimension aims to promote security and stability in and around the wider Baltic Sea region and to address the special regional development challenges of the region such as long distances, wide disparities in the standards of living, cold climatic conditions and insufficient transport and border crossing facilities.

The ND Partnership for Transport and Logistics was established in 2009. The Memorandum of Understanding of the NDPTL states: “the main goal of the Partnership is to improve, in compliance with the ecological needs of the region, the major transport connections and logistics in the Northern Dimension (ND) region to stimulate sustainable economic growth at the local/regional and global level by focusing on a limited number of priorities that reflect both regional and national priorities in a balanced way.” The specific aims of the NDPTL, as described in the MoU are to assist in:

- improving the major transnational transport connections between the Parties with the view of stimulating sustainable economic growth at the local/regional and global levels;
- accelerating the implementation of transport and logistics infrastructure projects along the major transnational connections, and facilitating the approval of projects of mutual interest;
- accelerating the removal of non-infrastructure related bottlenecks, affecting the flow of transport in and across the region, and facilitating the improvement of logistics in international supply chains;
- providing effective structures to monitor the implementation of the proposed projects and measures.

The study project was triggered by recent pilot project that explored feasibility of border-crossing piggyback transport between Moscow and Helsinki. This service must become part of a wider network of piggyback services within Russia and between Russia and its neighbouring countries, for which a strategy has been developed by Russian Railways RZD. The envisaged piggyback services carry trucks on trains, which is a novelty in most of the NDPTL-countries.

The objectives of the study were defined in the Terms of Reference, as follows:

The global objective is to facilitate the Northern Dimension Regional Transport Network connections across the Partner countries.

The specific objectives are to analyse applicable international/national legal basis for regulating the combined/intermodal transportation across the EU/CU and study feasibility for the piggyback transportation.
The expectation is that piggyback transport, if deployed widely on the NDPTL Regional Transport Network, can make the ND's transport systems more efficient. It will reduce the number of heavy goods vehicles at the border crossings and so relieve one of major hurdles for trade development in the ND region. Road hauliers are facing long queues and waiting times when crossing the borders between the European Union and the Customs Union.

A network of piggyback services can also contribute to the ambitions of reducing the impact of road transport on the environment. These ambitions are described in the European Commission’s 2011 “White Paper on Transport”\(^1\). The White Paper presents EC’s vision for the future of the EU transport system and defines a policy agenda for the next decade. Its ambition is to have thirty per cent of road freight over 300 km shifted to these other modes such as rail by 2030, and more than 50 % by 2050. This would serve to achieve a targeted 60% reduction in CO2 emissions and an equivalent reduction in oil dependency. The EC foresees that multimodal transport, relying on waterborne and rail modes for long hauls, will have a more important role. NDPTL’s expectation is that the development of piggyback services in the ND-region can contribute to realization of environmental ambitions.

This study will examine what position piggyback transport can take in the market of international transport and will look into the readiness of NDPTL for facilitating such piggyback transport.

The report contains the following chapters:

- Chapter 3 describes characteristics of piggyback transport and other means of combined transport and their strengths and weaknesses.
- Chapter 4 describes current combined transport offer in Northern Dimension and analyses existing plans for the development of piggyback transport, which is the Concept-1520 in particular.
- Chapter 5 analyses the business case of piggyback transport between Moscow and Helsinki.
- Chapter 6 presents legal issues of border-crossing piggyback transport for example related to unresolved liability and customs issues.
- Chapter 7 concludes on the prospects of piggyback and combined transport in border crossing transport and defines which actions are needed.

The study was completed under auspices of Office for Economic Policy and Regional Development (EPRD) Ltd, based in Kielce, Poland and conducted by:

- Huub Vrenken (Team Leader)
- Nataliia Dashchenko (Legal Expert)
- Julia Jia (Transport and Logistics Expert, Railistics GmbH)

\(^1\) COM(2011) 144 FINAL: Roadmap to a single European Transport Area – Towards a Competitive and Resource-Efficient Transport System
The study team had meetings with the relevant stakeholders in the development of the strategy for piggyback transport, government institutes that must facilitate piggyback transport, railway undertakings, suppliers of technology and potential clients.
3. Characteristics of Piggyback Transport and Combined Transport

3.1. Introduction – how to define Piggyback Transport

There is no official definition of piggyback transport which is adopted by the United Nations or other multinational bodies.

Official definitions of UN/ECE do exist for intermodal transport and for combined transport. Intermodal transport is defined as “Movement of goods (in one and the same loading unit or a vehicle) by successive modes of transport without handling of the goods themselves when changing modes.” UN/ECE used the term combined transport as being identical to the definition for intermodal transport. Also in use for combined transport is the ECMT-definition "Combination of means of transport where one (passive) transport means is carried by another (active) means which provides traction and consumes energy."

For transport policy purposes the ECMT restricts the term combined transport to cover: "Intermodal transport where the major part of the European journey is by rail, inland waterways or sea and any initial and/or final leg carried out by road are as short as possible". This addition of distance however has little practical value, because origins and destinations in practice are difficult to verify. It would also exclude a vast share of the traffic, compliant with UN/ECE definition of intermodal transport, that does prefer transport services from other terminals than their nearest for example because they are direct or more frequent.

This project defines piggyback transport as: “transport of semi-trailers or of trucks on top of railway wagons as part of a multimodal chain”. With this definition we have sought to conform to the recent ambitions initiated by RZD, as described in the introduction, and possibly followed by railway undertakings in other States of the NDPTL-region.

The definition is well fitted for assessing which actions are needed to facilitate this transport and for evaluating its prospects in the transport market. This means that the project first aim is to respond to immediate and mid-term needs and therefore has a problem solving nature.

The project will also keep eyes open for synergies and needs of other types of combined transport, in order to avoid that our efforts would need to be duplicated in the future in order to facilitate those types. A piggyback service for example may evolve into a service that also carries swap bodies and containers, either by using convertible or multi-purpose wagons or by a mixed wagon composition. The legal framework and the railway infrastructure should be equipped to cater for such development. And from a market perspective, these other types of combined rail/road transport may be more competitive compared to road than piggyback transport is. This will also be evaluated.

This chapter will describe characteristics of four different types of combined transport:

• unaccompanied transport of semi-trailers, which is the core subject of this report;
• unaccompanied transport of swap-bodies;
• unaccompanied transport of containers;
• accompanied combined transport, or Rolling Highways.
Their distinguishing factors concern:

- technology, being terminal equipment, wagon devices and intermodal loading units;
- requirements to terminal layout and railway infrastructure i.e. bridge and tunnel clearance parameters (or loading gauge) and maximum axle loads.
- the way transport services are being produced;
- the market segments for which they serve;
- (prevailing) business model(s);
- the conditions in which they are particularly successful.

3.2. Technical description of combined transport systems

3.2.1. Unaccompanied combined transport of semitrailers

The unaccompanied transport of semi-trailers requires pre-haulage (delivery of semi-trailers at the terminal) and end-haulage (collection of semi-trailers from the terminal) by trucks and therefore involves a more complex organization of an intermodal transport chain. The semitrailers are either lifted or pulled on (and off) the wagon.

Lifting, which is commonly referred to as vertical or craned transshipment, is the most common technique in current combined transport practice. For vertical transshipment these semi-trailers must be equipped with gripping edges and must be slightly reinforced. This requires an extra investment (of about €2000, according to Kombiconsult²) and a slight loss in loading capacity (up to 0.5 tons) which only those semi-trailer owners will do who actually intend to deploy them in combined transport services. Only a small, however increasing share of semi-trailers on the road is actually craneable.

For non-cranable semi-trailers require horizontal transshipment. Many horizontal techniques have been explored and tried in the last twenty years, all with the expectation that such techniques would break open the market of semi-trailers for rail, because they would not impose any burden to their road-transport based clients. None of these however has succeeded to achieve a wide-scale presence. Typically, they were either designed for small-scale handling only or they had disadvantages in railway and terminal operations. At this time there are two systems in focus: the Modalohr and Cargobeamer.

- Modalohr is used in the “Autostrada Ferroviaria Alpina”, a Transalpine Service between France and Italy, and in a service between Bettembourg (Luxembourg) and Perpignan (France, as Spanish border). It uses rotating platforms which are attached to the wagons. For (un)loading the platform rotates to enable semitrailers to be pulled on (or from) it by a road tractor (trailer or a MAFI-tractor) and then the platform can rotate back and slightly sink into the wagon. When introduced Modalohr planned to develop a wide and extendable network of terminals and services in and around France, but this has not materialized.
- The CargoBeamer uses cassettes (or “pallets” as called by the manufacturer), which are positioned parallel on both sides of a rail track. For loading, trucks pull their semi-trailers

²Kombiconsult GmbH 2012: Study on unaccompanied combined transport of semitrailers through Switzerland
on the cassette which then is pulled onto the special CargoBeamer railway wagon. These cassettes are craneable, also when loaded with a semi-trailer, and therefore can also be used in traffic with terminals which are equipped with conventional transshipment equipment. The CargoBeamer is in development. The project “Efficient Semi-Trailer Transport on Rail Baltica, which is co-funded by the Marco-Polo II program and done in cooperation with two leading railway undertakings, aims at setting up a service between Riga (on wide-gauge rail) and Rotterdam (on standard gauge rail).

![Figure 1 The Modalohr system (Source: concept 1520)](image1)

![Figure 2 Graphic presentation cargo beamer (Source: concept 1520)](image2)

Both systems, on first sight, have the potential of being part of very high performance systems designed for high frequency and fast transshipment. With terminals equipped for full train lengths of e.g. 750 metres and trains loading and unloading times as little as 30 minutes, capacities can be enormous. The advantage is not as evident if the full operational cycle is examined. For example much time is consumed for rotation of wagon sets in the terminals of the two horizontal techniques, amongst others for lashing and for all weighing and safety and brake checks. Also, arrival patterns of trucks in pre- and end-haulage tend to be dispersed and accommodating that would either involve long occupation times of the
cassettes (and dwell times of the wagon sets) or require intensive use of MAFI’s for intra-terminal movements of the semi-trailers. Further, sub-optimal terminal designs, e.g. shorter tracks, will have drastic impacts on terminal capacity because it would require intermediate shunting. Meanwhile, conventional terminals for voluminous traffic are using portal cranes that serve multiple wagon sets simultaneously.

RailCargo Austria developed the ISU-technique (“Innovativer Sattelschlepper Umschlag” translated as “innovative semi-trailer transhipment”). ISU is an example of a vertical transshipment technique which caters for non-craneable semi-trailers. The semi-trailer is pulled on to an ISU loading ramp where it rests on the ISU kingpin beam and the flexibly constructed ISU wheel loading equipment. With extensions of standard crane or reach stackers spreaders the semi-trailer then can easily be lifted into the pocket wagon. ISU is a low-investment system, but is not very productive and mainly useful for low-volume traffic or as complementary to conventional vertical transhipment.

The wagons used for semi-trailers in the European Union are pocket (or recess) wagons, which have lowered floors for the semi-trailer’s wheel sets and a device for kingpins to rest on. Pocket wagons are either suited for one or two semi-trailers and most can also carry containers and swap-bodies. Modalohr and CargoBeamer have special wagon designs, with higher investments and maintenance costs.

3.2.2. Unaccompanied combined transport of swap bodies

The most common way of combined transport in EU for intra-European traffic uses swap bodies as intermodal loading unit. Swap bodies are boxes which are transferred between flat wagons in railways and road chassis. Their most prominent advantage above semi-trailers is in the production of railway services. First the simple design of flat wagons requires lower investment and has lower maintenance costs. Second, since swap bodies have no wheel axis, they are lighter than semi-trailers and thus have a better ratio between cargo weight and deadweight. Third, swap bodies on flat wagons have a more advantageous loading gauge. A disadvantage of swap bodies in comparison to semi-trailers is that they are less versatile. With semi-trailers it is easier and more practical to have them deployed for other tasks. They are also more flexible for collecting of return cargo, e.g. from locations far from the end-terminal.

There are many types of swap bodies. First distinction is in length: road trains can carry 2 shorter (C-class, typically 7.45 meters) swap bodies and trucks can carry 1 larger (A-class, up to 13.6 meters) body. Other distinctions are in features like being curtain-sided, hard covered or special designs like bodies for tanks and temperature conditioned bodies.

Swap bodies are commonly vertically transshipped, by portal cranes or reach stackers. They need to be bottom lifted and therefore cranes must be equipped with so-called spreaders that can reach up to the bottom grips. Like in semi-trailers there have been many trials and also actual implementations of horizontal transshipment solutions however none of those has developed beyond niche operations.
3.2.3. Combined transport of maritime containers

Very important in the landscape of combined transport in Europe is the container traffic. This segment comprises about half of all combined transport in the European Union and has had highest growth rates in the last decades. It is hinterland transport between seaport and inland terminals of 20-foot and 40-foot containers. Like swap bodies it uses flat wagons in rail. A difference is that these containers are top lifted and they can be stacked on top of each other. These features of containers make them very attractive for rail transport, terminal handling and storage.

For use in continental traffic the maritime ISO-containers which are not as attractive because of their higher deadweights and their narrower dimensions. Very important disadvantage is that their widths are highly unattractive for the positioning of standard pallets.

3.2.4. Rolling Highways

Rolling Highways is a combined transport system in which full trucks are carried. These trucks are accompanied by their drivers and therefore train sets include one or few passenger wagons with, on long-distance services, passenger’s facilities. Trains are loaded and unloaded by driving the trucks from/onto a ramp and there is no craning involved. The most common technique of loading is by driving all trucks in a queue from one end of the train to their respective positions. All wagons are connected to form a driving lane. An alternative system is the Modalohr, which has rotating wagon platforms which trucks drive on(off) from(to) the side of the train. It is mainly used for unaccompanied transport of semi-trailers but can also be used for accompanied Rolling Highways.

The loading gauge needed is a major constraint for Rolling Highway. A significant part of railway infrastructure in Europe cannot be used for this traffic because the design of tunnels and the height of bridges crossing are not sufficient for the trucks loaded on top of the wagons. This is partly being solved by using railway wagons with lower floors, but despite that, some Rolling Highway services cannot cater for the highest heavy goods vehicles and limit vehicle height to e.g. 3.80 meters, while road transport allow for 4 meters height. The weight of the Rolling Highway train is no a constraint. In comparison to other rail freight segments, trucks are rather light weight and a full truck would typically be carried by 2x2-axle wagons. Therefore load will be well below maximum axle loads, which commonly are 20 or 22.5 tons per axle or more.

The Rolling Highway services in the European Union are shuttle services from terminal to terminal. These shuttle services are separate, i.e. not part of a Rolling Highway network, meaning that trucks always continue their journeys by road and never by a connecting Rolling Highway service.

Table 1 is an overview of Rolling Highway services in the European Union. The table shows that all Rolling Highway services are either Alp-crossing or within the Alps-region.
<table>
<thead>
<tr>
<th></th>
<th>Terminal 1</th>
<th>Terminal 2</th>
<th>Distance over road</th>
<th>Time over rail</th>
<th>Frequency (per week)</th>
<th>By</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Freiburg in Breisgau (D)</td>
<td>Novara (I)</td>
<td>435</td>
<td>11 hrs</td>
<td>60</td>
<td>Ralpin AG</td>
</tr>
<tr>
<td>2</td>
<td>Basel (CH)</td>
<td>Lugano (CH)</td>
<td>270</td>
<td>7 hrs</td>
<td>5</td>
<td>Ralpin AG</td>
</tr>
<tr>
<td>3</td>
<td>Worgl</td>
<td>Brenner (A)</td>
<td>92</td>
<td>2:25 hrs</td>
<td>91</td>
<td>Oekombi</td>
</tr>
<tr>
<td>4</td>
<td>Trieste (I)</td>
<td>Salzburg (A)</td>
<td>362</td>
<td>11 hrs</td>
<td>19</td>
<td>Oekombi</td>
</tr>
<tr>
<td>5</td>
<td>Trento (I)</td>
<td>Regensburg (D)</td>
<td>450</td>
<td>9-10.5 hrs</td>
<td>13</td>
<td>a.o. Trenitalia, Bayernhafen</td>
</tr>
<tr>
<td>6</td>
<td>Trento (I)</td>
<td>Worgl (CH)</td>
<td>229</td>
<td>6:30 hrs</td>
<td>12</td>
<td>Oekombi</td>
</tr>
<tr>
<td>7</td>
<td>Wels (A)</td>
<td>Maribor (Slov)</td>
<td></td>
<td>8-9 hrs</td>
<td>23</td>
<td>Oekombi</td>
</tr>
<tr>
<td>8</td>
<td>Aiton (F)</td>
<td>Orbassano (I)</td>
<td>175</td>
<td>3:30 hrs</td>
<td>21</td>
<td>Autostrada Ferroviadia Alpina</td>
</tr>
</tbody>
</table>

Table 1: Rolling Highway services in the European Union (2012)

Three services by Oekombi were recently suspended:
- between Wels (Austria) and Szeged (Hungary),
- between Wels (Austria) and Curtici/Arad (Rumania), and
- between Salzburg (Austria) and Villach (Austria).

The Rolling Highway terminals are simple in design. The conventional rolling highway terminals have a simple ramp bridging between road surface and the final wagon in the train set. There should be facilities and sufficient space for accommodating the (up to 40) trucks waiting for their departure. They require railway tracks for the full lengths of the trains. Net loading and unloading of the train can be done within 30 minutes for each direction, and therefore provides a high rotation and productive use of railway equipment.

The terminals for Modalohr, with rotating platforms, require space for truck movement and parking on either side of the railway track over its full length. With good truck moving space for trucks on the terminal (un)loading times of the trains can be very short.

3.3. Competitiveness of combined transport

3.3.1. Economics of combined transport

The concept of all types of combined transport is to create economies of scale. Generally, combined transport is more attractive with higher distances, because then the scale advantages of railways can really be exploited. The graph in Figure 3 is a simplified characterization of that.
On short distance there is a cost disadvantage, because of the terminal costs and of costs of delivering and collecting the intermodal loading unit at and from the terminal. These pre- and end-haulage costs are high: it concerns relatively short trucking distances and involves many inefficiencies like waiting times with clients and in the terminals and often empty runs as well.

The long-haul by rail is where costs are saved and therefore the costs of combined transport do not increase with distance as much as in road transport. Beyond a certain distance (break-even distance; “x” in the graph), the costs of combined transport will be lower than costs of road transport.

The more efficient the railway service, the flatter the slope of cost line of combined transport in the graph will be. More efficient for example means more units per train and faster rotation of all the equipment. With a flatter slope, the break-even point “x”, above which combined transport has a cost advantage would shift to the left.

The graphical presentation is helpful for explaining the competitiveness. The linear presentation of costs however certainly is a simplification. There are many variables which affect costs in a non-linear way. For example in road and in combined transport, the process can be upheld at border crossings or because of limited opening hours of clients or of terminals. Long-distance road transport operations are also discontinuous because of regulation on driving times, requiring drivers to take a long rest after about 10 hours driving. This implies a daily range trucks of about 650 kilometers and causes that road costs will leap when this range is exceeded.

The most important cost elements of door-to-door combined transport are presented in Table 2.
Pre-haulage and end-haulage by truck: efficient if truck waiting times at the client and at the terminal are low, so the truck can make several round trips per day. Practice however is that trucks often only make one roundtrip (delivery and collection of intermodal loading unit) per day, which makes it a very costly part of the chain.

Railway operations – traction: These consist of time-dependent:
- capital costs of the locomotive (either leasing costs or depreciation and interest costs),
- insurance costs,
- driver costs,
- maintenance costs (partly).
Distance dependent are energy costs (electric power or diesel) and part of maintenance costs.

Railway operations – wagons: These are the time-dependent capital costs of the wagons (either leasing costs or depreciation and interest costs) and the maintenance costs which are time and distance dependent.

Infrastructure charges: Charged by infrastructure managers. The charging system varies between countries. Typical are charges per train-kilometer for slot reservation, often with additional charges which depend on the gross weight of the train and sometimes on the type of equipment as well.

Service charges: These are imposed if the train service moves through hubs, gateways or marshaling yards or for shunting operations near and in the terminals or border crossings. Also for e.g. braking tests.

Terminal handling charges: Equipment of terminals depends on the traffic volumes and is more mechanized with higher volumes. Typical tariffs are between €20 and €50 per loading unit should cover annual operational costs. There will be additional charges if multiple moves are needed per transshipment and/or if the loading unit is stored.

Loading unit: These are the capital costs ((or leasing costs) of the loading unit.

Chain integration: These are all costs of administrating the traffic (reservation, contracting, documentation and invoicing), communication and monitoring (optional). They also include costs of additional insurance and/or other ways of covering of liabilities.

<table>
<thead>
<tr>
<th>Table 2 Cost elements of door-to-door transport chains</th>
</tr>
</thead>
</table>

The rail-borne costs for semi-trailers are higher than for swap bodies because of:
- higher capital and maintenance costs of the wagons,
- higher capital costs of the loading unit,
- less cargo per train because of a higher deadweight,
- less cargo per train because of a lower number of positions per train.
Total differences in railway operations costs are in the order of up to 15% per loading unit.

Overall the production of the railway transport service is of a fixed costs (time-dependent) nature. Even energy costs are fixed, because it concerns a fixed schedule. Once set, the most important aspect of costs therefore is the utilization of the service. This utilization is high if demand and supply are well matched and traffic is well balanced. Traffic is balanced if there
is demand for both directions of the service and if there is continuous demand over the year, meaning no strong seasonal pattern of demand.

The share of costs of the railway services in the total door-to-door chain can vary. Typically, in continental traffic in the European Union over 1000 km distance with average service profiles, these railway costs including those of charges for infrastructure and services are around 60% of the door-to-door costs, if clients are on less than 70 km distance from the terminals on both ends.

3.3.2. Quality and logistics issues

Very important for competitiveness of combined transport services is the level of service quality. This quality has many dimensions and their judgment depends on very subjective client’s preferences.

Many clients will require combined transport to provide a service profile which does not deviate too much from road transport. To be as attractive as road combined transport solutions should be available in a high frequency, should offer attractive lead times, be as punctual, secure and easy to use (i.e. no administrative barriers). These potential clients will always assess quality of combined transport against the available road transport alternatives.

Their first quality assessment will compare door-to-door combined transport chains with road transport on the same corridor. This comparison between modes does not necessarily require “highest possible” quality though. For example

- in multiple-day journeys, over longer distances and crossing congested borders, tolerance margins for lead times in practice are not as strict as in shorter distance transport.
- on medium distances (300-500 km) overnight services by combined transport appear valuable. Door-to-door transport times are e.g. between 5PM and 8AM (15 hours, compared to 5-10 hours for road), but match very well with the client’s business patterns.

Clients also need to make a trade-off between quality parameters. It is likely that a relaxing on lead-times will significantly improve punctuality. This punctuality is an important parameter for clients for planning their logistics and scheduling their activities and is mostly more required than high speed.

More frequent users may evaluate quality in a more comprehensive way and assess how combined transport can take a role in their logistics system. Truck (and driver) operations are designed for rotations which are as fast as possible only, because interruptions have their price tags. Combined transport can be used for including buffers, for example by intermediate storage, short or longer run, of loading units in terminals. Consignees then may be served from the end-terminal instead of from the consignor’s address.

In certain segments, mainly in lower value commodities, transport price is the key criterion and clients are willing to consider combined transport even if level of service is low.
Some types of cargo need cargo conditioning and monitoring of cargo.

3.3.3. Competitiveness of Rolling Highways

The economics of rolling highway is different from other types of combined transport. If judged on technical characteristics only, rolling highway is more costly than single mode road transport:

- there are no savings in capital costs, because full trucks are carried.
- savings in driver costs are only possible if drivers would not be accompanying the service and the truck would be handed over to a second driver upon arrival at the second terminal.
- there are savings in fuel, but these are not substantial because a low energy efficiency of the train, due to the limited number of trucks per train and the high share of dead weight.
- like other combined transport, this type involves unproductive waiting times at the terminal.

For clients, the decision to use Rolling Highway is on other grounds than the economies of scale as in combined transport:

- rolling highway services can bridge a distance in time which otherwise would need to be used for resting. That adds to the productivity of trucks and drivers.
- rolling highway is used on corridors on which road transport is discouraged and these rail services are encouraged. This can be through financial incentives (levies to road and subsidies to rail), driving bans (e.g. night traffic) or administrative bans (limited number of permits which in EU concerns non-EU trucks, in practice often from Turkish origin.

To be attractive it is important that the rolling highway service is well designed to match client’s needs. Services should not be too long for example, because part of its advantage vanishes if the drivers must accompany their truck outside of their resting hours.

Rolling Highways do not provide the potential logistics benefits like forms of unaccompanied combined transport do. There are no time or storage buffers; truck drivers will minimise waiting times before departure of the services and will resume their travel upon arrival in the end terminal.

3.4. Business models in European combined transport

Combined transport operators are the key players in the market of European combined transport. They bear the commercial risk of the combined transport service. Their offer consists of scheduled rail transport services (or service networks) between combined transport terminals, transshipment of loading units and sometimes additional services like pre- and end-haulage, storage and maintenance services. The bulk of their costs are procurement of railway and transshipment capacity, which are fixed over a longer period of time. Because of that, their commercial risks are mainly on the revenue side: they will be profitable if utilization rates are sufficient.

In unaccompanied transport the dominating models are:
• joint ventures between railway companies and (road-based) logistics companies. This is the traditional business model in European intra-continental transport. Companies like Kombiverkehr (Germany) and Hupac (Switzerland) were established in the 1970s. They are united in the International Union for Road-Rail combined transport (UIRR). In its initial decades after establishment membership of UIRR required that the railway undertakings to have less than 50% capital share in the company. This prevented domination by the (former monopolistic) railways. The shareholders are also by far the largest clients of the combined transport services, but services are open to third parties as well.

• large forwarding and logistics companies which carry full risks. These companies have sufficient base loads to fill up their railway services to acceptable levels, but still are open for third parties as clients. Examples are Ambrogio (Italy) and Ewals (Netherlands), both active in the intra-continental traffic.

• affiliates of railway companies. These are mainly active in the hinterland traffic of containers. This segment used to be monopolized by the national railway companies until the mid-1990s. In 2010 the former monopoly in international container movements, Intercontainer ICF, was liquidized. Major players now are IFB (Belgium) in hinterland transport and DB Schenker (Germany) in different segments.

• players in the maritime sector and their joint ventures. Examples are ERS (owned by Ocean shipping line Maersk) and Polzug (owned by Hamburg seaport operator HHLA). ERS mainly secures Maersk’s own hinterland traffic but is open to third parties to, while the interest of participating in Polzug is to strengthen the position of Hamburg port for Eastern European clients.

In most of these business models the railway undertakings have the role of carrier only, with logistics or maritime companies as client. This constellation prevents that railways are marketing their services directly to shippers, which would put them in direct competition with their clients. Meanwhile, the business models in which users of combined transport have part of commercial risk of the transport services and have invested in equipment and logistic systems for those transport services improve their stability and long-run economic sustainable.

Rolling Highways in the European Union is a railways business. The largest Rolling-Highway company is Oekombi from Austria. The ownership of Ralpine is shared between Swiss combined transport company Hupac (33%), the Swiss railway companies BLS AG (33%) and SBB Cargo AG (33%) and the Italian railway company Trenitalia (1%). The service Aiton and Orbassano is a mix of Rolling Highways and carriage of semi-trailers using the so-called Modalohr-technique. It is exploited by the railway companies SNCF-Geodis and Trenitalia. The Trento-Regensburg service was due to be suspended by the national railway companies but then taken over by regional semi-public partners in cooperation with regional railway operators as partners.

All Rolling Highway services are open for all clients and bookings commonly can be done up until shortly to departures, similarly to e.g. ferry services.
3.5. Policies in EU that affect combined transport

Intermodal transport can relieve the congested road network, has less negative impacts on the environment, less dependency on fossil fuels and has better safety records than road transport. Besides those comparative advantages it also contributes to trade, regional development and cohesion in the European Union. Because of those advantages intermodal transport (and in recent years “co-modal” transport) have been central in European and lower level transport policies.

European Union for example, in its “White Paper: Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system” defines ambitions of a modal shift of 30% of road freight over 300 kilometers to rail or waterborne transport. Even though not specifically addressing combined transport, it is obvious that such ambition can only be achieved by combined transport taking a more substantial role.

3.5.1. European policies that promote intermodal transport

Despite the reliance on intermodal transport of European policies, EU-level policy instruments for its promoting are rather weak. Means of financial incentives are constrained by regulation against State Aid which is one of the most fundamental building stones of European Law. The European policy instruments which are meant for promoting combined transport are:

- exemption from fiscal duties of road vehicles which are used in combined transport chains. This concerns the costs charged to Heavy Goods Vehicles for using the infrastructure, which some States levy by a fixed annual amount (Euro-Vignette) and other by variable, distance dependent, taxation, like the “LKW-Maut” in Germany.
- allowing of gross (vehicle + cargo) weights of 44 tons of road vehicles, if they are used in combined transport chains. Most European States allow maximum gross weights of 40 tons for heavy goods vehicles and in those States this would allow for additional 4 tons of cargo weight.
- co-funding of initiatives for intermodal transport development, consisting of Marco Polo for business ventures, TEN-T for infrastructure and grants for Research and Development.

The Marco Polo program supports the development of intermodal transport services in their start-up phase. The commercial risk in this early phase of operations is particularly risky because clients still need to be attracted, while operators must face full costs of producing the services. The Marco Polo grant depends on the amount of traffic shifted from road to intermodal transport, but equals the initial exploitation losses at maximum. Applicants must demonstrate that the service will be profitable after few years. Only services which are not in competition with existing intermodal services can be supported, to prevent that public funding would distort competition. The last call for applications in the budgeting period 2007–2013 of the Marco Polo II Program was launched in March 2013 with a deadline on 23 August 2013. The European Commission is in the process of evaluating and redefining the Marco Polo Program. The expectation is that the funding instrument will become available for a wider range of projects that will improve transport efficiency and reduce negative environmental impacts.
The EU-level funding instrument for the development of the Trans-European Network of Transport is a generic instrument for co-funding of infrastructure for each of the transport modes in predefined networks. The instrument was designed to promote that EU-Member States considered the international dimension in their infrastructure development planning. The priorities in funding decisions are consistent with European transport objectives and therefore TEN-T has weak incentives of intermodal transport promotion.

The EU involvement of research and development projects concerns pre-competitive research of which results will become available for the industry as a whole. Projects that improve intermodal transport for example by improving technology, organization or integration can obtain co-funding through the EU Framework Program for Research. Intermodal transport, because of its policy relevance, has had an important share of the research projects in the last twenty years.

3.5.2. Other European policies that affect combined transport

Principally all legislation for transport business is of relevance to the intermodal transport segments as well. Most distinguishing for competitiveness of combined transport are pricing policies and regulation on driving times.

Pricing policies of infrastructure and of energy affect key components of the costs of road and combined transport operations:

- European legislation on charging for infrastructure use in road and in rail determines that users of infrastructure should be charged in a way that at least so-called marginal costs of use are covered. Some States have implemented this for road by charging operators a variable amount, per driven kilometer, on the national infrastructure. An example is the German LKW-Maut. Other States have fixed annual charges (Euro-Vignettes) to road operators. In all EU-States, railway undertakings are charged variable fees, mostly per train-kilometer and sometimes weight-dependent as well. These infrastructure charges are a substantial share in the costs of operators in railway transport and in road transport in long-distance trades.

- European legislation harmonizes excise duties on energy by setting minimum levels. Excise duties are a large share of procurement prices of all types of fuel and have significant impact for operations of road vehicles and diesel trains. Whether and how operations of electric trains depends on the type of electric power generation.

In debate are policies of internalizing of external costs, which are costs of congestion, accidents, environmental and climate change. Until now these have not been structurally implemented.

The European legislation on driving and resting times was designed for promoting safety of road transport operations. (In railways driving hours are regulated in railway safety rules) and defines weekly working schedules of drivers. The legislation on working hours is meant to protect working conditions. These are mentioned in the light of modal competition because the limitations particularly have affected long-distance, multiple-day, road transport operations. The constraints have impact on travel time of transport services, which is a quality issue. Also important is the impact on the costs: the legislation limits the total time trucks and drivers are moving and therefore their annual production.
3.5.3. National or local level policies that affect intermodal transport

Overall the EU Member States subscribe that developing of combined transport will positively contribute to their economies.

National or local level public involvement is most obvious in the development of a combined transport terminal network. Depending on the role of the terminal this can be done:

- by the Infrastructure Manager, as part of its task of maintaining and developing the railway network and anticipating on increases in transport demand.
- in partnership between the Infrastructure Manager and regional authorities and/or port authorities.
- in partnership between the Infrastructure Manager and private entities, like transport operators, stevedores or shippers.

The common principle if government funding is involved is that terminals will be public, meaning that they should be accessible for all road and railway operators.

Some states have had funds for supporting private (sometimes dedicated) terminals by (co-)funding the infrastructure between those terminals and the public railway network, in order to stimulate the use of railways instead of road. For such co-funding, governments may require the user to demonstrate a shift of cargo from road operations to railways.

Austria and Switzerland are the exceptional cases which directly subsidize railway undertakings. This is because of their policies to protect the vulnerable environment in the Alps which is burdened by heavy transit traffic of goods. Railways are obliged to transfer these subsidies to their clients by incorporating them in their tariffs.

Highly important for intermodal transport have been national weekend bans for heavy goods vehicles, even though these bans had no intention of stimulating combined transport. The bans give combined transport an advantage in multiple day trips in and around the weekend and it increases the number of operational days of assets and staff and so decreases unit costs. In some areas there are night bans as well, with similar advantages.

Very important for Rolling Highway and to a lesser extent for unaccompanied combined transport has been the system of international road permits, managed by the International Transport Forum (ITF). Road transport companies which are not established in the European Union may have a limited number of permits granted for operation in the European Union. By shipping their vehicle on combined transport services the road operators avoid expending from the permits allocated to them.
4. Piggyback Transport in the Northern Dimension Region

4.1. Today’s combined transport in the Northern Dimension Region

The supply of combined transport in the Northern Dimension Region (apart from Germany) is very small. To a large extent this can be explained by transport demand characteristics. A key success factor of combined transport services e.g. in other parts of Europe is that there is a concentration of demand for freight transport on corridors around poles that generate much and regular freight traffic, like large seaports. In West and Central Europe, combined transport services prosper in transalpine traffic and in hinterland traffic of the largest seaports. These have become backbones that constitute intermodal transport networks, to which other links can be connected. Such backbones and poles of traffic generation do not exist in the Northern Dimension countries, because of lower spatial density of population and economic activities.

4.1.1. Combined transport in Northern Dimension Region which crosses the EU-CU border

All of today’s combined rail-road transport in the region of NDPT, which cross the EU-CU borders are container services. They are few in number and even less if a narrower definition is applied, requiring regularity of services.

The most well-known combined transport service is the Viking service, which connects Klaipeda in Lithuania with Minsk in Belarus and Ilyichevsk in Ukraine. The Viking service actually started off as piggyback services in 2003. It was a landmark project with high international visibility. It had much political attention from the countries involved and from port authorities and railways. They managed to set up this high-priority service with short border procedures and therefore attractive lead times. After 1 year of operations Viking turned into a container service, because it appeared that there was insufficient market interest for a piggyback service for trucks and semi-trailers. This was partly due to disappointing performance of the service. It had technical problems because of difficult truck manoeuvring on and down the train and after operation started it appeared that there were no real competitive advantages (speed and costs) compared to road transport. Today most of the traffic on the Viking is loaded or unloaded in Belarus, i.e. transit over the full distance has become rare. The service should be daily, but if demand is too low service frequency is decreased. In 2012 the service carried 60,000 TEU.

Other cross-border container services are also on demand, and have low and irregular frequencies. Examples are:

- the container service Merkurij connects Klaipeda (Lithuania) and Moscow.
- the container service Zauk between Dragisti (Lithuania) and Minsk and Ozinki (Russia).

4.1.2. Other combined transport in the Northern Dimension Region

There is also only little offer of regular domestic combined transport services in each of the countries bordering the Customs Union. None were identified in the Estonia, Latvia and Lithuania. The Finish railway company, VR Transpoint, offers only one container service: between Helsinki and Oulu (port in West Finland). The company states in its annual report that its efforts to increase combined transport failed, because of frost damage caused by the
harsh winters in 2009 and 2010 and problems with the punctuality of trains. This put freight carryings back on the road.

Poland has container services, some functioning in trade between EU and the Customs Union. These international services are interrupted at the border however. It is a natural border because of differences in railway gauge, but also in business ventures. There is no company offering cross-border operations between Belarus and Poland. For example intermodal operator Polzug offers services from Germany and Poland up to its eastern border terminal in Malaszewicze, but for onward transport it only offers assistance to its clients, by either booking onward transport on railways or on road transport companies.

In Sweden, Norway and Denmark there is ample offer of all types of unaccompanied combined transport with a reasonable network of terminals. Demand has never been sufficient for a dense transport network of regular services as elsewhere in the European Union and the provision of intermodal transport services long time has been rather unstable with alternating players in the market. Today services for all types of loading units are being provided in flexible schedules for example by CargoNet. CargoNet offers intermodal services in both countries and between these countries. For southbound services to Germany and onward CargoNet has partnerships with central European operators and uses maritime connections between Scandinavian and German ports. Another typical example is the North-Rail-express, a daily service over nearly 2000 km between Norwegian terminals in Oslo and Narvik, crossing Swedish territory. It is offered by DB Schenker (Germany), Schenker AS (Norway) and Green Cargo (Sweden) and combines intermodal cargo with new cars. In Denmark the Swiss combined transport operator Hupac offers domestic and southbound international services.

Germany is the only country in the Northern Dimension region with a high offer of all types of unaccompanied combined transport services by a range of combined transport operators. The service networks are most dense for domestic and transalpine transport, but also many of the other EU-states are directly served from Germany. In continental transport the swap body is the preferred loading unit. The share of semi-trailers in this segment has been increasing after the tunnel infrastructure in Switzerland was adjusted for accommodating more height of loading units, but remains far less important. Accompanied (rolling highway) services are sparsely available, only in a few transalpine services.

The combined transport offer in Russia only comprises container services. There are domestic and several international services into the Customs Union States (Kazachstan and Belarus.) Several of the Russian container trains are dedicated to one client, for example the recently established service from Saint-Petersburg which supplies an automotive factory near Moscow. The most common way of producing container services in Russia is in single wagon networks. Trains are composed in accordance with demand and move once they have sufficient length. Schedules are not fixed and as a consequence lead times and punctuality of these services are very low and therefore not attractive to the current clients of road transport.
4.2. RZD’s strategy of developing piggyback transport: Concept-1520

4.2.1. Introduction
In 2011 a working group of RZD presented a strategy for developing a network of piggyback services within Russian Federation and between the Russian Federation and its neighboring countries. This strategy, described in the report “Concept of the organization of piggyback transportation in the area 1520” (further in this document to be referred as Concept-1520) was proposed by RZD to the Russian Ministry of Transportation in 2011. Concept-1520 includes international combined transport services to and through other States in the Northern Dimension Region.

The report was approved by scientific council of Russian Railways but decisions about actual implementation of the strategy and commitment to the investments are still pending. So far only RZD and affiliated companies and Russian railway research institutes engaged in developing the strategy. No non-Russian entities, neither governmental nor railway or logistics companies, have yet been involved.

The key points of Concept-1520 are:
- development of 18 core terminals and a number of regional terminals for the transfer of vehicles between road and railways. All core terminals are in the Russian Federation. Regional terminals are within Russia and in neighboring countries. A map of these terminals and how they will be linked is presented in Annex 1.
- development of frequent and regular piggyback services between these terminals. A map in Annex 2 presents the envisaged routes.
- a design of a railway wagon which can carry all types of intermodal loading units (ILU): full trucks, semi-trailers, containers and swap bodies.
- a proposal for terminal layout which can handle these trains with this mix of ILU within one hour time span.

Piggyback transport services will be a new activity to RZD. The infancy of the piggyback transport development and the fact that political decisions are pending means that and all investments in terminals and rolling stock are yet to be done and also that it is most likely that the concept-1520 as presented will be subject to many changes.

4.2.2. The service network as envisaged by Concept-1520
The Concept-1520 based its strategy on analyses of combined transport solutions provided in other, mainly European countries. The similarity of the proposed offer of intermodal transport services in Concept-1520 with European practice is that it concerns services in fixed schedules. The services in the Concept-1520 network which are connecting regions in the Northern Dimension countries are presented in Table 3. The listed frequencies of services in 2015 and 2020 are indicative, because the timing of the introduction of the services is not precisely defined. Press announcements have been forecasting commencement of the Moscow-Helsinki service from the end of 2013, but these announcements are not realistic.
<table>
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<th>Route</th>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moscow – Helsinki</td>
<td>1069</td>
<td>2 / 3</td>
<td>Bely Rast (Moscow) – Buslovskaja – Kouvolu (FIN)</td>
</tr>
<tr>
<td>Eurasia-Line</td>
<td>5440</td>
<td>3 / 6</td>
<td>Horgos (KZ) – Almaty (KZ) – Astana (KZ) – Ufa - Samara - N. Novgorod – Bely Rast (Moscow) – V. Luki – Molodechno (BY) – Grodno (BY)</td>
</tr>
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<td>Moscow – Slavkov</td>
<td>1913</td>
<td>1 / 3</td>
<td>Vorsino – Brjansk – Suzemka – Kiev (UA) – Slavkov (PL)</td>
</tr>
<tr>
<td><strong>Phase II</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moscow – Vienna (AUS)</td>
<td>2323</td>
<td></td>
<td>Vorsino – Brjansk – Suzemka – Kiev (UA) – Mukachevo (UA) – Bratislava (SK) – Vienna (AUS)</td>
</tr>
<tr>
<td>Slavkov (PL) – Horgos (KZ)</td>
<td>6939</td>
<td></td>
<td>Slavkov (PL) – Kiev (UA) – Harkov (UA) – Gukovo – Lihaja – Vologograd – Astrahan – Chimkent (KZ) – Kandagach (KZ) – Kyzylorda (KZ) – Almaty (KZ) – Horgos (KZ)</td>
</tr>
<tr>
<td>St Petersburg – Moscow</td>
<td>650</td>
<td></td>
<td>Express route</td>
</tr>
</tbody>
</table>

**Table 3: Overview of the Piggyback Services of Concept-1520 which are in the ND-Region**

The services will be produced as shuttles. Shuttles are services of which train compositions and time schedules will be fixed for all sequential services. With shuttles the complete wagon sets will be moved in and out of the terminals and there will be no rearranging of the wagons by which time consuming and costly marshaling is avoided. This simplicity of shuttle service production is a clear advantage and is ideal for the quality and efficiency of services.

- The quality improves because there is no time lost in composing the train and therefore terminal-to-terminal travel time can be short and recomposing of trains also increases risks of delays. Travel time and punctuality are particularly important in the targeted market segment, which is used to high performance levels of road transport.
- The efficiency improves because of a better utilization and rotation of equipment. The wagons are dedicated to the specific service and because of that hardly have any idle times. There can also be an advantage for locomotives and drives. They are assigned to services which are uninterrupted and this reduces empty locomotive runs between tasks. The extent of efficiency gains will depend much on the details of the service design.

A disadvantage of shuttle is its higher commercial risk. Practice in transport is that demand very often is not balanced and because of that services have a high utilization of capacity in one direction but less so in the other. There are also seasonal patterns and even patterns of varying demand within the span of a week, which cause variance in demand. In the shuttle production supply of capacity will not be adjusted and therefore utilization rates drop and service revenues will be below service costs on certain days.

Provision of shuttles will be a break with the traditional operations in Russian railways in which trains and schedules are composed on a daily basis, in accordance with demand. In these traditional production schemes the objective is to have all trains well filled. In case of a decline in demand train departures are postponed or services rerouted through marshaling yards.
Fluctuations in demand also affect the competing road transport, but there is more impact on intermodal services. For intermodal roundtrips return cargo must be found in the vicinity of the terminal, while road haulers can acquire cargo from wider geographical ranges. This makes that decisions on terminal locations and the creation of an efficient terminal network are essential for regular demand and high utilization.

4.2.3. The RZD universal wagon

The strategy of Concept-1520 has been to provide a service with lowest barriers for its users. The prime focus is on carrying semi-trailers and full trucks with horizontal transshipment. This way truck owners can use combined transport service without needing to amend their vehicles and therefore without any additional investment. The concept also allows for the transportation of containers and swap bodies, which would require vertical transshipment. (Swap bodies, which prevail in European combined transport, are rare in the current Russian logistics industry.)

For this purpose, RZD developed a versatile wagon, suited for carrying each of these loading units. The prototype of this wagon was presented end of 2012 and is in the process of certification. The features of the wagon are summarized in Table 4.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loading capacity</td>
<td>60 tons</td>
</tr>
<tr>
<td>Maximum axle load</td>
<td>23.5 tons/axle</td>
</tr>
<tr>
<td>Maximum speed</td>
<td>120 km/hour</td>
</tr>
<tr>
<td>Wheel diameter</td>
<td>957 mm</td>
</tr>
<tr>
<td>Width</td>
<td>3200 mm</td>
</tr>
<tr>
<td>Height above railhead</td>
<td>1035 mm</td>
</tr>
<tr>
<td>Length</td>
<td>21500 mm</td>
</tr>
</tbody>
</table>

Table 4 Features of RZD’s prototype wagon for piggyback

![Photo: RZD](image)

Figure 4 The prototype of RZD flat wagon for piggyback transport

The maximum dimensions of the vehicles which can be carried by the wagons are listed in Table 5. The table shows that the design parameters of the wagon are consistent with legislation on road vehicle dimensions in Russia, Belarus and European Union. All countries
have the 2600 mm width allowed for temperature conditioned vehicles; the limit for conventional vehicles 2550 mm. The length parameters are sufficient for maximum permissible lengths too. The maximum gross vehicle weight of vehicles in most European countries is 40 tons and many have an exemption rule allowing for 44 tons for vehicles used in combined transport chains.

<table>
<thead>
<tr>
<th>Maximum Parameter</th>
<th>RZD</th>
<th>EU</th>
<th>Russia/Belarus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Gross Vehicle Weight</td>
<td>44 tons</td>
<td>40 tons</td>
<td>38 - 44 tons</td>
</tr>
<tr>
<td>Maximum Vehicle Width</td>
<td>2600 mm</td>
<td>2600 mm</td>
<td>2600 mm</td>
</tr>
<tr>
<td>Maximum Vehicle Height</td>
<td>4000 mm</td>
<td>4000 mm</td>
<td>4000 mm</td>
</tr>
<tr>
<td>Maximum Length of Semi-trailer</td>
<td>13600 mm</td>
<td>13600 mm</td>
<td>13600 mm</td>
</tr>
<tr>
<td>Maximum Length of Articulated Vehicle</td>
<td>16500 mm</td>
<td>16500 mm</td>
<td>20000 mm</td>
</tr>
<tr>
<td>Maximum Length of Articulated Vehicle + Semi</td>
<td>18750 mm</td>
<td>18750 mm</td>
<td>20000 mm</td>
</tr>
<tr>
<td>Maximum Length of Road Train</td>
<td>20000 mm</td>
<td>--</td>
<td>20000 mm</td>
</tr>
</tbody>
</table>

Table 5 Compatibility of maximum road vehicle dimensions suited for RZD’s piggyback wagon with road vehicle stock

There are some exemptions, however. The largest vehicles in Finland, Denmark and Sweden cannot be accommodated. These countries also allow for higher weights than 44 tons, and Sweden and Finland also allow for over 20 meters long road trains and for 4200 mm height.

The railway wagons are meant to be loaded from the side, but they also allow trucks to drive in the length direction of the train by passing from one wagon to the next, as is done in Rolling Highway services in Central Europe. For containers, the multipurpose wagon has capacity for three 20-foot containers or one 40-foot or 45-foot container together with one 20 foot containers, all as long as the 60 tons weight constraint is being considered.

RZD wants to use trains of length between 750 meters and 1250 meters for its domestic. All border crossing services in Northern Dimension will have train lengths less than 750 meters (notably between 30 and 34 wagons), because of infrastructural constraints in the neighboring countries. The services are also open for accompanied transport (Rolling Highways) and for that purpose one or two passenger wagons will be added for accommodating the drivers.

4.2.4. The terminals in the Concept-1520 network

Piggyback transport will be a new venture for railways in Russia and surrounding countries therefore the network of terminals for this transport needs to be developed from zero. The combined transport terminals currently in operation are designed for vertical transshipment of containers. The technical state of some of these container terminals is good but overall the network is poorly developed.

The Concept 1520 proposes a terminal layout with one rail track for full 1050-meter train length and a variant with 2 tracks each for a half train length. Schematic overviews of two principle alternatives are presented in Annex 3.

The implication of the requirement for fast horizontal transshipment from the side is that terminals will be quite space intensive. The rail tracks need to be enclosed by road tracks.
and the trucks and trailers need much manoeuvring space when (un)loading of the train and for intra-terminal movements between parking lots and the train. The terminals which are equipped to handle multiple trains per day also need much parking capacity. The surfaces of the proposed terminals are around 200,000 m² of which slightly more than half is the actual transshipment area and the remaining part is for buildings and parking infrastructure. The proposed terminal designs have more than 200 parking lots. The concept also allows for container (and swap body) traffic and storage of these intermodal units is also envisaged in these parking lots.

The cross-border combined transport services will use maximum 750-meters trains. The estimated terminal surface size for such terminals would be 10-15% less if similar terminal layouts are adopted. However, supposing that the foreign terminals are not core terminals in the network and would have far lower throughputs their sizes could be significantly smaller. Despite these looser requirements, none of the neighboring countries in the 1520-network have suitable terminals available. The need for side access for the horizontal transshipment is what causes the problems in particular.

A specification of terminal investments was handed on request and is summarized in Table 6. The table includes the investments in infrastructure and common services, not in handling equipment. Precise information about the particular terminal layout misses, however transshipment track length suggests that it concerns a terminal with 4-railway tracks. The total sum, €65 million, is very high in comparison of green-field railway terminal developments elsewhere with typical investments of about €10 - €15 million.

There are some elements which make investment costs of Concept-1520 terminals high:

- the large surface area. Conventional terminals for vertical transshipment with 4 railway tracks would need about half of the surface;
- the requirement of vertical transshipment (by reach stackers) is quite demanding for the foundation of the terminal surface;
- the ramp and railway wagons need to be on equal levels and therefore the railway tracks should be sunk;
- a very part of the surface for parking;
- the need for facilities for drivers which will be client to rolling highways.

Figure 5 Design of leveled ramp and railway track, allowing for horizontal transshipment
<table>
<thead>
<tr>
<th>Description</th>
<th>€ million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface procurement</td>
<td>3.5</td>
</tr>
<tr>
<td>Ground works and basic infrastructure for water, power, internet</td>
<td>21.6</td>
</tr>
<tr>
<td>- outside terminal area</td>
<td>(2.1)</td>
</tr>
<tr>
<td>- transshipment area</td>
<td>(13.7)</td>
</tr>
<tr>
<td>- other areas within terminal premises</td>
<td>(5.8)</td>
</tr>
<tr>
<td>Railway infrastructure</td>
<td>13.0</td>
</tr>
<tr>
<td>- connecting track to railways network (2 km)</td>
<td>(3.3)</td>
</tr>
<tr>
<td>- sloped track inside terminal premises</td>
<td>(2.7)</td>
</tr>
<tr>
<td>- transshipment tracks (4.4km)</td>
<td>(7.0)</td>
</tr>
<tr>
<td>Road infrastructure: parking and traffic zones</td>
<td>14.7</td>
</tr>
<tr>
<td>- outside terminal area</td>
<td>(3.9)</td>
</tr>
<tr>
<td>- within terminal area</td>
<td>(10.8)</td>
</tr>
<tr>
<td>Security and customs</td>
<td>2.9</td>
</tr>
<tr>
<td>- fencing</td>
<td>(0.9)</td>
</tr>
<tr>
<td>- gate, checkpoints, scanning</td>
<td>(2.0)</td>
</tr>
<tr>
<td>Buildings</td>
<td>5.1</td>
</tr>
<tr>
<td>- office building</td>
<td>(2.5)</td>
</tr>
<tr>
<td>- restaurant &amp; business centre</td>
<td>(2.5)</td>
</tr>
<tr>
<td>Workshops and services</td>
<td>3.0</td>
</tr>
<tr>
<td>- for railway equipment</td>
<td>(0.8)</td>
</tr>
<tr>
<td>- for road equipment</td>
<td>(2.1)</td>
</tr>
<tr>
<td>Vegetation and decoration</td>
<td>0.9</td>
</tr>
<tr>
<td>Fire protection</td>
<td>0.4</td>
</tr>
<tr>
<td>Total</td>
<td>65.0</td>
</tr>
</tbody>
</table>

*Table 6 Breakdown of terminal investment costs*

Figure 6 Horizontal transshipment in the pilot test, using adapted flat wagon

The equipment needed for loading and unloading of the train consists of:
- MAFI-tractors (Figure 7), which pull semi-trailers on and off the train and for intra-terminal movement of semi-trailers.
• Reach stackers for vertical transshipment of containers. The reach-stackers can also be used for vertical transshipment of swap bodies and of craneable semitrailers. For that they need to be equipped with a spreader, because these ILU must be bottom-lifted.
• Road transport vehicles. Truck-tractors that move the semi-trailers between the terminal and the client can also move up to wagon for delivering or collecting their ILU.

The amount of equipment in a terminal depends on how fast trains should be handled and on that matter Concept-1520 is very ambitious. To achieve handling of a train in 1 hour an estimated 6 MAFI would be needed per 1050 meters track. (The assumption is that all ILU will be semi-trailer.) Each MAFI would handle about 12 semi-trailers (6 on, 6 off). MAFI is not high-cost equipment (estimated investment sum is €40,000), but costly is that the handling is labor intensive. The semi-trailer needs to be manually (un-)tied from and to the railway wagon and (de-)coupled on the wagon and when parked. Estimate is that presence of two persons per MAFI is needed. With a low number of trains per day this will be particularly costly and then it will be worthwhile to consider longer terminal dwell times of the trains for saving terminal costs. This would for example apply to the regional terminals, which include all terminals outside of Russian territory.

4.2.5. The railway infrastructure
The requirement which is most specific to piggyback transport is the required clearance profile (or loading gauge), which must allow for the highest and widest trucks and semitrailers. The Concept-1520 design parameters are 4000 mm road vehicle height and a width of 2600 mm above a railhead of 1035 mm.

The Concept-1520 report indicates that for the Russian network clearances profiles still need to be verified and there may need for upgrading. A compatibility check in the Network Statements of the neighboring countries did not provide complete clarity. These Network Statements are official documents in which, amongst others, all relevant characteristics of the railway infrastructure are described. These descriptions however appear to be imprecise for of clearance profiles. For example the Network Statements of Finnish Transport Agency and of Lithuanian Railways provide a graphical presentation of the valid clearance profiles as in Figure 8. The Finnish statement presents exceptions on their network where clearance gauges would be more restricted.
The standard clearance parameters in Finland (and Lithuania) are too narrow for the RZD-wagon profile. That means that possibilities need to be checked by the infrastructure manager on a case to case basis. The test runs between Moscow and Helsinki proved suitability on that stretch.

For routes on the 1435-network in Europe maps have been compiled by railway and/or intermodal operators, based on their practice. For example infrastructure links which are coded P400 are suitable for transport of 4-meter semitrailers, however not on 1035 mm platforms but on pocket (or recess) wagons. The maps do not have an official status.

The other important parameters are maximum train length (often because of safety systems) and maximum axle loads. They will not impose any constraints:

- For the international services trains of 750 meters length are proposed which can be accommodated in Finland (max 925 meters), Estonia (800m), Latvia (850m) and Lithuania (850m) and Belarus (800m). Still, all relevant routes should be reviewed on their applicability for trains of 750 m case-by-case. The proposed services using 1050 meter trains are domestic services in Russia.
- The design axle load of the wagon is 23.5 tons. Finland, Lithuania and Belarus can only accommodate 22.5 tons axle load. Because of the weight restrictions of the trucks and of ILU carried, the actual axle load will remain far below the 22.5 tons.

The Concept-1520 report presents an inventory of sections in the Piggyback network which potentially will be bottlenecks because of capacity constraints of infrastructure. These are all sections of which utilization is over 75% of railway capacity. The bottlenecks in the network relevant for the Northern Dimension network are presented in Table 7.
Table 7 Railway capacity constraints of the ND piggyback network. (Source: Concept-1520)

<table>
<thead>
<tr>
<th>Route</th>
<th>route length (km)</th>
<th>location of the bottleneck (km number)</th>
<th>I/C rate</th>
<th>location name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moscow - Helsinki</td>
<td>1069</td>
<td>37</td>
<td>0,77</td>
<td>Povarovo I - Klin</td>
</tr>
<tr>
<td>Horgos - Grodno</td>
<td>5440</td>
<td>9</td>
<td>1,03</td>
<td>Krjazh - Lipjagi</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13</td>
<td>0,96</td>
<td>Podosenka - Zemcy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18</td>
<td>0,98</td>
<td>Kunja - Serdce</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td>1,17</td>
<td>Vorobeckaja - Velikie Lugi</td>
</tr>
<tr>
<td>Moscow - Slavkov</td>
<td>1913</td>
<td>9</td>
<td>0,86</td>
<td>Solnechnja - Vnukovo</td>
</tr>
<tr>
<td>Moscow - Kaliningrad</td>
<td>1374</td>
<td>18</td>
<td>1</td>
<td>Shahovskaja - Blagoveshenskoe</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13</td>
<td>0,96</td>
<td>Podosenka - Zemcy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18</td>
<td>0,98</td>
<td>Serdce - Kunja</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>1,17</td>
<td>Velikie Lugi - Vorobeckaja</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18</td>
<td>1</td>
<td>Zavarujka - Sebezh</td>
</tr>
<tr>
<td>Moscow - Vienna</td>
<td>2323</td>
<td>2</td>
<td>0,8</td>
<td>Brjansk - Lgovskij - Zapadnyj Park</td>
</tr>
<tr>
<td>Slavkov - Horgos</td>
<td>6939</td>
<td>11</td>
<td>1,12</td>
<td>Zamchalovo - Lihaja</td>
</tr>
<tr>
<td>St Petersburg - Moscow</td>
<td>650</td>
<td>39</td>
<td>0,84</td>
<td>Krjukovo - Moscow</td>
</tr>
</tbody>
</table>

4.2.6. Alternatives under consideration

The Concept-1520 made a principle choice for the combined transport system as described in the previous sections. RZD-affiliated and independent companies have been and still are examining alternatives, which are briefly presented here.

The independent company Rustrail developed a wagon for horizontal transshipment. The wagon has a rotating platform. Its operations are similar to the Modalohr system as described in chapter 3.1. Its mechanism had to differ from Modalohr because the latter does not stand the extreme weather variations which characteristic of Russia. The Rustrail wagon is compatible with RZD’s terminal design. The advantages of Rustrail’s wagon compared to RZD’s flat wagon are easier manoeuvring of the ILU when loading and unloading and easier lashing of the ILU which may be shortening handling time and labor input. The wagons are also slightly shorter (more wagons in a train), but their procurement costs may be higher. The prototype is available and its testing started in the second quarter of 2013.

Bely Rast, the envisaged terminal operator north of Moscow, has been examining different terminal designs. It investigated alternatives for craned combined transport, either by full reach stacker operations or by portal cranes. Bely Rast did not proceed on this venue, because they consider horizontal transshipment more appropriate solution in the Russian context.

Logistics service provider Eurosib questioned the feasibility of the concept as a whole and considered containerized transport more cost effective, for railway operations as well as for terminal infrastructure. It would make development of the combined transport service network more flexible because also small-scale terminals can be connected and it can build...
on terminal infrastructure which is available, albeit not everywhere in a very good condition. Small-scale terminals will be equipped with reach-stackers and above a certain level of throughput portal cranes can be installed. Even (non-craneable) semi-trailers could be handled for example by using the low-costs Austrian ISU-system, albeit only in the initial phase when demand is still low. Eurosib also stressed that the logistics companies should be involved in the development of combined transport services from the beginning. This is critical for the success of the service. The logistics companies are the potential clients and combined transport services should meet with their requirements and interests.
5. The Pilot Project: piggyback transport between Moscow and Helsinki

5.1. The pilot run between Moscow and Helsinki

In 2011 the Railway companies RZD (Russian Federation) and VR Transpoint (Finland) cooperated in trial runs of a piggyback train to be operated between Helsinki and Moscow. These trial runs were technical, for testing suitability of rolling stock and of infrastructure. The runs were with a limited number of wagons, loaded with empty and full vehicles, loaded with paper products. VR Transpoint provided the wagons for this test, since VR was the only partner with adequate rolling stock yet available. It concerned flat wagons which VR had already used in domestic combined transport services, including for semi-trailers. For lashing of semi-trailers and trucks the wagons have devices of which Figure 9 shows a detail.

![Figure 9 Tying wheels on the flat wagon (photo of pilot test)](image)

The pilot run was a test to verify technical parameters in practice and to have a more detailed assessment of railway operations in such service. The assessments provided the following results:

- the loading gauge is no limiting factor. Infrastructure on this stretch is sufficient for the used wagon carrying a 4000mm road vehicle.
- the speed limitation when carrying road vehicles would be 90 km/hour. (This however is preliminary, because for higher speeds the testers should have obtained special permission. This might be done in later phase.)
- a train length of 670 meters is technical feasible. This allows for 30 freight wagons, 2 passenger wagons and the locomotive. So is the maximum train weight of 3000 tons (which is the absolute maximum weight capacity and would rarely be needed).
- travel time was 19 hours and 18 minutes. About 4 hours of this was spent at the border, but since it concerned an occasional test with special conditions for the border crossing, these 4 hours are a poor indication for piggyback services.
- when scheduling the pilot run no important infrastructure constraints appeared, which means that piggyback services can be scheduled without affecting existing traffic.
- for piggyback train movements to be uninterrupted they would need speeds of 120 km/hour. With lower speeds than 120 km/hour passenger trains will be given the right to pass first, requiring the piggyback train to temporarily move to a sidetrack. (The Concept-1520 aims at 120 km/hour speeds.)
No technical evaluation of VR’s wagon was handed. It is not clear whether RZD decided for the newly designed wagon type because of shortcomings of VR’s wagons (e.g. its slightly higher loading gauge) or because of commercial reasons. Fact is that if Concept-1520 would materialize a high number of wagons needs to be procured. Concept-1520 estimates e.g. that 268 wagons would be needed for the first phase of the Moscow-Helsinki service with a 2-daily frequency alone.

5.2. Characteristics of the piggyback service Moscow-Helsinki
Concept-1520 describes piggyback services on a general level. This section will depict how the service can look like. It is based on information from RZD and other stakeholders and on own assessment.

5.2.1. The route and terminals
The service will connect the terminals Bely Rast and Kouvola. Both terminals still need to be developed.

- Bely Rast is located near Moscow’s outer northern tangential highway A170, on about 40 km distance to the city center of Moscow. Bely Rast is close to the railway link Moscow - Saint-Petersburg and has good road access to all areas of Greater Moscow. The Moscow road network is quite congested and an advantage of Bely Rast is that drivers have alternative routes to choose from. Bely Rast will be a core terminal in the Piggyback transport network and therefore will be dimensioned and equipped as described in chapter 4. It will also be a high performance terminal and aim at handling trains in about 1 hour time.

- Kouvola is located 160 km North-East of Helsinki. The location is on the route to Russia from many economic centers in Finland and fairly easily accessible by road. This is an advantage above e.g. Helsinki which would be unattractive to clients which are not based within the region around Helsinki. Concept-1520 labels Kouvola as Regional terminal but does not provide any further details of this characterization (and of course its design would be a decision by the Finnish Transport Agency and stakeholders). Kouvola will need to construct infrastructure of side access to provide side access to the railway track, or expand existing side access which is of about 200 meters length today. VR expected investment sum for an upgrade to accommodate the piggyback train at €2 million.

The distance over rail between the Bely Rast and the Russian-Finish border is 902 km and between the border and Kouvola is 92 km, total therefore 994 km. The route on Russian territory is the shorter route, which is primarily used by passenger trains, but also by a container transport service. Other freight routes are available but are longer and allow for speeds up to 80 km/hour only. The net travel time (excluding border time) concluded from the pilot run is just above 15 hours, which corresponds with an average speed of 65 km/hour. This is a high average speed compared to other freight transport services in the European market, even to the higher-speed combined transport services.
5.2.2. The schedule
If the logic as sketched in Concept-1520 would be followed a railway roundtrip could consist of the following phases:

<table>
<thead>
<tr>
<th>Roundtrip Phase</th>
<th>duration</th>
<th>Total time</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Terminal handling Bely Rast</td>
<td>2 hours</td>
<td>2 hours</td>
</tr>
<tr>
<td>• Train preparation before departure Bely Rast</td>
<td>100 min</td>
<td>1 hour 40</td>
</tr>
<tr>
<td>• Travel</td>
<td>2 x (15 hours 20 min)</td>
<td>30 hours 40</td>
</tr>
<tr>
<td>• Terminal handling Kouvola</td>
<td>4 hours</td>
<td>4 hours</td>
</tr>
<tr>
<td>• Train preparation before departure Kouvola</td>
<td>100 min</td>
<td>1 hour 40</td>
</tr>
<tr>
<td>• Border Crossings</td>
<td>2x4 hours</td>
<td>8 hours</td>
</tr>
<tr>
<td>Total roundtrip time</td>
<td></td>
<td>48 hours</td>
</tr>
</tbody>
</table>

*Table 8 Roundtrip phases – Moscow - Helsinki*

With a 48 hour roundtrip time and with the fixed services schedules, successive roundtrips could start each 2 days. Our own assessment however is that operating such schedule will be too risky. The scheme has no buffers and in practice it will be difficult, if possible at all, to catch up with delays. Unfortunately such delays an inevitable reality in railway service production and with tight schedules delays will have an onward effect in the chain. For example with delayed arrival in the terminal, handling of the train may need to be postponed because the (un)loading track is in use.

A more relaxed schedule, e.g. creating a 3-days (72 hour) roundtrip, is more realistic and can be operated more reliably. For clients this would result in a schedule in which they deliver the loading unit in the early evening of day 1 in the terminal of origin and can have it collected in the morning of day 3. This would still be as fast as direct road transport. (Such “A-C”-schedule is also best practice over such distance in EU’s dense combined transport network.) Moreover, to clients who do not operate 24/7 it would not make any difference whether the ILU would be available in late evening or early morning and to them the tighter schedule would add no value.

The situation is different for Rolling Highways, with trucks on the train, accompanied by drivers. To them the faster schedule does provide significant advantages. In the faster schedule drivers will already be idle for 24 hours and this would increase with higher lead times.

The train will be composed of 30 freight wagons and 2 passenger wagons.

5.3. Tariffs, costs and competitiveness of the piggyback service Moscow-Helsinki

5.3.1. Railway tariffing and costs
In the Russian Federation, tariffing of rail transport services is regulated through Federal Tariff Service (FTS) of Russia. Companies can procure railway traction services from RZD against catalogued tariffs. The tariffs include any costs of traction (locomotive, staff, power supply) and costs related to infrastructure, but do not include the costs of wagons and...
transhipment costs. The tariffing system is based on RZD’s cost structure and service production and tariffs depend on the number of wagons, weight, wagon characteristics and origin and destination of the service.

Applying the standard tariff on the relation between Bely Rast and the Buslovskaya border crossing would produce a tariff of 51,000 rubles (about €1230) for a single trip. This railway covers only the traction costs of a part of the route. Today’s road transport tariffs are less than €1000 and therefore RZD’s standard tariff would put Piggyback out of competition against road.

For that reason the working group for developing Piggyback Transport is proposing to reduce that tariff and have it in accordance with actual operating costs. The differences are presented in Table 9.

<table>
<thead>
<tr>
<th></th>
<th>Standard rate</th>
<th>Special rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>per wagon km</td>
<td>Single trip</td>
</tr>
<tr>
<td>Tariff - distance</td>
<td>1318</td>
<td>902</td>
</tr>
<tr>
<td>Loaded truck</td>
<td>38.67</td>
<td>50,967</td>
</tr>
<tr>
<td>Empty truck</td>
<td>26.53</td>
<td>34,967</td>
</tr>
<tr>
<td>Loaded semitrailer</td>
<td>38.67</td>
<td>50,967</td>
</tr>
<tr>
<td>Empty semitrailer</td>
<td>26.53</td>
<td>34,967</td>
</tr>
</tbody>
</table>

*Table 9 Tariffs for piggyback-transport between Bely Rast and Buslovskaya (in Rubles.)*

A first difference is in “tariff-distance”: 1318 km versus 902 km. This difference (most likely) is a reflection of estimated unproductive distance (moving empty wagons and distance to be covered before locomotive can start its actual duty) which is characteristic in the traditional single-wagon transport production. In the shuttle production with fixed train composition this unproductive distance would be zero and therefore the working group proposes 902 km as tariff distance.

The second difference is in the tariff per wagon-kilometre. The standard tariff considers average production characteristics in RZD. It is likely to include for example the average number of hours that drivers are actually on the train and the average annual production of locomotives. In the shuttle system the production can be lean. If staff and locomotives would be dedicated to the shuttle service only, their productivity will be well above the average of RZD as a whole. This is reflected in the “special tariff”. It is based on analyses of operational characteristics of the piggyback services from which the needs for assets and staff can be derived.

An own assessment of operational costs produces results which are 10-15% below the proposed special tariff. This own assessment assumed a 3-days roundtrip, a lean schedule of deploying rolling stock and drivers, only semi-trailers and therefore no passenger wagon, common European wage levels and locomotive leasing costs, Finnish infrastructure charges and a margin of 20% for profit and organizational overhead. Such low costs would be realistic for a (small) company which would be dedicated to this traffic only.

The special tariff was proposed to Federal Tariff Service by the working group and approved just for one year when the trial runs have been carried out. An approval of tariffs towards
the development of a long-term piggyback transportation is still pending. The consequence of non-approval would be that any Piggyback service on the Russian territory would be significantly higher priced than road transport and therefore not viable.

5.3.2. Door to door costs of unaccompanied piggyback transport (semi-trailers)
The actual competitiveness will be determined by calculation of total door-to-door costs. This is presented in Table 10. The costs are calculated for the (theoretical) case of 100% utilization of the railway service and of trucks in pre- and endhaulage and for a more realistic average utilization rate of 85%, which incorporates imbalances and fluctuations in demand.

<table>
<thead>
<tr>
<th>utilization rate</th>
<th>100%</th>
<th>85%</th>
</tr>
</thead>
<tbody>
<tr>
<td>tariff for RZD-traction</td>
<td>434 €</td>
<td>510 €</td>
</tr>
<tr>
<td>costs of VR-traction (estimate)</td>
<td>54 €</td>
<td>64 €</td>
</tr>
<tr>
<td>wagon costs</td>
<td>42 €</td>
<td>49 €</td>
</tr>
<tr>
<td>transhipment tariff Bely Rast</td>
<td>30 €</td>
<td>30 €</td>
</tr>
<tr>
<td>transhipment tariff Kouvola</td>
<td>40 €</td>
<td>40 €</td>
</tr>
<tr>
<td>semi-trailer costs (when in CT-chain)</td>
<td>34 €</td>
<td>34 €</td>
</tr>
<tr>
<td>road haulage costs Moscow (50km)</td>
<td>83 €</td>
<td>98 €</td>
</tr>
<tr>
<td>road haulage costs Helsinki (150km)</td>
<td>234 €</td>
<td>275 €</td>
</tr>
<tr>
<td>chain management and insurance</td>
<td>80 €</td>
<td>80 €</td>
</tr>
<tr>
<td></td>
<td>1031 €</td>
<td>1180 €</td>
</tr>
</tbody>
</table>

Table 10 Costs of door-to-door transport between Moscow and Helsinki of a semi-trailer using Piggyback transport.

Further assumptions and explanations of this calculation are:
- the costs of railway traction in Finland is slightly higher (per km) than in Russia. This is because of the relatively short-distance railway operations between the border and the terminal, in which also involves “unproductive” activities like the positioning of locomotive and procedures at departure in the terminal and the border station.
- it assumes the 3-day roundtrip schedule for the railway service as basis for determining wagon costs and semi-trailer costs.
- the RZD and VR will only provide traction and therefore wagon costs are presented separately. Assumption is a highly productive wagon use: 100 roundtrips per year which corresponds with 300 days of annual service.
- the transhipment tariff in Kouvola is higher than in Bely Rast because that terminal will have higher labour costs and a lower annual throughput
- costs of road transport assets are derived from a road costing report (NEA, 2011), which bases its results on systematic monitoring of business cost in the international road industry.
- the semi-trailer costs are the capital (or leasing) costs of semitrailer for the part of the chain that they are on the train or in the terminal.
- for truck driver costs and fuel costs local values are applied.
- the costs of pre and endhaulage can vary largely. These will very much depend on the efficiency which can be achieved in the cycle. It is obvious though that idle times in these cycles are higher and daily distances are far lower in this business than in long-distance segment. For the 150km distance to Helsinki it is assumed that a truck will make one
roundtrip per day (1 delivery and 1 collection). For the 50km in Moscow an average of 1.5 roundtrips is assumed. E.g. if the distance in Finland would be 50 km, for example to Kotka, road costs there would still be €186 (instead of €275 in the table above).

- costs of the passenger wagons in the train are not attributed to the semi-trailer traffic, because drivers do not accompany the semi-trailers on the train.

### 5.3.3. Door to door costs of accompanied piggyback transport (trucks)

The calculation will be different if the service would be used as Rolling Highways, i.e. if accompanied trucks are carried. In that case the client will save transport operational costs, because there are no expenses on fuel and far less wear and tear of the assets. There are also savings of driver costs, but these are bounded. Since it concerns a long journey, drivers that accompany the truck during the trip and the waiting time before train departure will be compensated for part of that time, even though not productive. Table 11 summarises the differential cost analysis of using the service for accompanied piggyback transport in comparison to road transport.

<table>
<thead>
<tr>
<th>utilization rate</th>
<th>100%</th>
<th>85%</th>
</tr>
</thead>
<tbody>
<tr>
<td>tariff for RZD-traction</td>
<td>434 €</td>
<td>510 €</td>
</tr>
<tr>
<td>costs of VR-traction (estimate)</td>
<td>54 €</td>
<td>64 €</td>
</tr>
<tr>
<td>wagon costs</td>
<td>42 €</td>
<td>49 €</td>
</tr>
<tr>
<td>terminal tariff Bely Rast</td>
<td>10 €</td>
<td>10 €</td>
</tr>
<tr>
<td>terminal tariff Kouvolå</td>
<td>20 €</td>
<td>20 €</td>
</tr>
<tr>
<td>use passenger wagon</td>
<td>80 €</td>
<td>94 €</td>
</tr>
<tr>
<td><strong>Total costs of using Piggyback Service</strong></td>
<td><strong>640 €</strong></td>
<td><strong>747 €</strong></td>
</tr>
<tr>
<td>costs of idle time driver (1 day)</td>
<td>120 €</td>
<td>120 €</td>
</tr>
<tr>
<td><strong>Total costs to client, including costs of his driver</strong></td>
<td><strong>760 €</strong></td>
<td><strong>867 €</strong></td>
</tr>
<tr>
<td>- savings in fuel costs and variable road vehicle costs</td>
<td>-/- 308 €</td>
<td>-/- 308 €</td>
</tr>
<tr>
<td><strong>Balance (Total costs minus savings)</strong></td>
<td><strong>452 €</strong></td>
<td><strong>559 €</strong></td>
</tr>
</tbody>
</table>

*Table 11 Differential costs of using the Moscow-Kouvola service as Rolling-Highways in comparison to road transport*

Further assumptions and explanations of the calculation in Table 11 are:

- terminal handling tariffs will be lower than for unaccompanied transport, because services will involve minor assistance by terminal staff and no use of terminal equipment.
- the drivers will use the passenger wagon. The assumption in this calculation is that for this service only 1 passenger wagon is added and that 50% of freight wagons are used for accompanied transport. This assumption corresponds with an utilization of the passenger wagon which is high compared to Concept-1520’s assumed average. The cost estimate therefore must be considered as a minimum.
- the savings of variable and fuel costs and the costs of driver’s idle times assume the cost profile of a Russian road haulier.

### 5.3.4. Competitiveness of piggyback transport

Piggyback transport can be considered competitive if door-to-door prices do not exceed those of road transport. This is the case however, as can be seen in Table 12. Market prices in road transport are well below piggyback transport of semi-trailers. The market prices
reflect operational costs and the ratio between demand and supply. In periods of low demand the tariffs will be low as well. Also, tariffs in the direction with highest demand (from Finland into Russia) will be higher than tariffs in the opposite direction. The higher tariffs may also reflect specific cost enhancing requirements to equipment or service. The market values in Table 12 are based on roundtrip values.

The range of the market prices was given by different logistics service providers. They are well below what transport would need to cost if it was done by a Finnish driver. The lower estimated cost level (€1200) assumes that all fuel is bought in Russia, which is most likely. Current practice is that fairly all road traffic in this corridor is done by Russian trucks and drivers, which makes market tariffs being as low as presented in the table.

| Road transport – market prices / Russian driver | €800-€1150 |
| Road transport – estimate, Finnish driver | €1200 - €1400 |
| Unaccompanied combined transport - semitrailer | €1180 |
| Accompanied combined transport – (Rolling Highway) | €1340-€1560 |

**Table 12 Cost comparison of door-to-door costs between Moscow and Helsinki (one-way)**

The conclusion is that a piggyback service cannot compete on price: using the service would increase transport costs, for semi-trailer and even more so for trucks in Rolling Highways. The important information that comes for the comparison with transport costs by the Finish drivers is that this competitive disadvantage is not because of temporary particular market conditions, but is structural. Also in comparison to using a Finish driver, the savings are negligible for unaccompanied transport and none for accompanied transport.

The analysis was not carried out for swap-bodies and containers. There could be cost savings if one wagon would carry a 13.6-meter swap body (or 40-45 foot container) together with a 20-foot container. In that case the costs related to traction and wagon could be shared between these two ILU instead of attributed to one semi-trailer, resulting in a saving of about €200 for the swap body and €400 for the 20-foot container. This would require however that such combination can actually be made, which is unlikely because the service does not connect to a seaport and therefore container transport is not in demand.

Table 13 is a brief sensitivity analysis of how costs can be affected if certain operational parameters change. A combination of all four would increase road costs by €255 and decrease piggyback costs of semi-trailers by €65 and would turn piggyback transport into a more competitive mode. Most of this gain (€200) would be the result of obstructed border procedures for road transport.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Impact on transport costs (per semi-trailer).</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 extra day for road because of border delay.</td>
<td>Road cost (Russian driver) increase is €200, because of extra driver costs and capital costs of truck and semi-trailer.</td>
<td>Roundtrip times would be 6 days instead of 4 days. May occur in demand peaks, but exception to the rule.</td>
</tr>
<tr>
<td>faster train services: 1 roundtrip in 2 days</td>
<td>Piggyback cost decrease is €25, because lower costs of wagons and semi-trailer.</td>
<td>For Rolling Highways there would be a more significant saving (€90) for driver and truck.</td>
</tr>
</tbody>
</table>
more lean railway company will provide service (no RZD tariff) | Piggyback cost decrease is between €50 and €70 | No tariff system, but based on production costs of dedicated operator; European prices (cf. 5.3.1).
---|---|---
Fuel price increase of 25% | road cost increase is €55; piggyback cost increase is €20 | Piggyback costs increase because of pre- and endhaulage; potential impact on energy costs of railways too.

| Table 13 Sensitivity analysis of competitiveness of piggyback transport to changes in transport operations. |

Table 14 is a sensitivity analysis of how costs can be affected by policy measures. Two of the measures can have a significant impact:

- The introduction of user charges for highway traffic is under consideration in Russia. Tariffs are not yet known. E.g. Germany has a system that must cover user dependent road maintenance costs and has charges of €0.155 per km and more for vehicles with more polluting engines. Proposal for Russian roads is 3.5 Ruble/km, which would increase road costs by about €75.

- The vehicle weight exemption is applied in many countries in the European Union and can have significant benefits. These however are only for vehicles that carry goods heavier than about 300 kg/m³. Many bulk products have such high weight density, but e.g. semi-finished goods and consumer goods don’t. It will be exceptional that clients can save the 25% of costs on a roundtrip basis.

Not mentioned in the table, however obvious is that any public intervention by direct subsidy that piggyback transport operations would have an impact equal to the amount of subsidy.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Impact on transport costs (per semi-trailer).</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tax exemption for road vehicles when used in pre- and endhaulage</td>
<td>Piggyback costs reduce €5–€10</td>
<td>only interesting if the truck would be dedicated to this type of transport</td>
</tr>
<tr>
<td>User charges to heavy goods vehicles for road infrastructure</td>
<td>road costs increase by €10 per €0.01 user charge.</td>
<td>Assuming an exemption for road vehicles used in intermodal chains (as in EU).</td>
</tr>
<tr>
<td>Allowing for 44 tons gross vehicle weight in intermodal chains</td>
<td>piggyback costs per ton cargo decrease between 0 and 25%.</td>
<td>Russian maximum gross vehicle weight is 38 tons, so 6 tons extra can be carried. Impact only on heavy weighted goods.</td>
</tr>
</tbody>
</table>

| Table 14 Sensitivity analysis of competitiveness of piggyback transport to policy measures |
5.4. Business prospects of the pilot piggyback service

5.4.1. The relevant market

For a viable exploitation, combined transport must have a high frequency and needs a high utilization rate. The previous analysis for example assumes a utilization rate of 85%, averaged over the year and both directions. With a frequency of 2 trains per day, as Concept-1520, assumes and 300 operating days per year this would require an annual amount of road vehicles of 15,300 per direction.

Ideally, for a demand analysis, statistics would have a level of detail that includes region of origin and destination. Such statistics are not available. Relevant indicators of demand are:

- the number of lorries crossing the Russian-Finnish border in 2012 was about 350,000 per direction.
- of these about 310,000 crossed the 3 most southern borders, (Finnish towns Vaalima (53%), Nuijamaa (29%) and Imatra(18%), which are on the relevant road corridor.

Even though no precise statistics can be given, it is fair to conclude that this would provide a sufficient potential for setting up a combined transport service. Companies in the logistics sector indicated that they perceived that the majority of border crossing goods traffic was in relation with Moscow. Moreover, given the effort and costs of crossing borders and its formalities, it is plausible to assume that most cargo will be shipped in consolidated packages and therefore in the (relevant) larger size category of vehicles.

The border between Finland and Russia used to include a high share of transit traffic, which for example used the Roll-on Roll-off (roro) or ferry service from Swedish or northern German to Finnish ports. This has long time been a preferred route, because border procedures and high costs in the port of Saint-Petersburg made using that port particularly unattractive. According to market players, this situation has changed to the better and most freight traffic nowadays is routed through Saint-Petersburg. For transit traffic still there the piggyback service will certainly not be attractive for accompanied trucks, because of extremely unproductive use of the driver on the short road distance in Finland. In theory it could be attractive for unaccompanied transport, but the complexity of the chain (road-roro-road-piggyback-road) argues against it.

The rudimentary assumption that 30% of trucks are in the relevant market (i.e. being related to South-Finland and Moscow area and in a 4-or-more-axle-truck) would produce a potential market size for piggyback transport of 93,000 trucks per direction per year. For a viable exploitation of a 2-daily piggyback transport service – the Concept-1520 short-term ambition - 16.5% of this should be attracted.

Noteworthy is that there is an imbalance in cargo flows between Russia and the European Union countries. The value of Russian exports exceeds Russian imports, however far most of Russian exports (79% in 2012) concerns energy products, which uses bulk transport means like sea and pipeline. Much of the westbound international road traffic is trucks because road cargo from Russia into Finland (and Europe) is lacking. For piggyback service this has no important meaning, since the service is also well suited to carry the empty units.
5.4.2. The perception of market players

The target market of the piggyback services is not yet well defined in Concept-1520. Combined transport services in the European Union have logistics service providers as clients, but in theory Concept-1520’s target could also be to address shippers, either or not with own account road transport.

Meetings with few potential clients from the logistics industry gave the following response to the plans for Piggyback Transport:

- the companies expect high railway costs because of regulated tariff system in railways. The standard tariffs would certainly be extraordinary high and they doubt that RZD is willing to offer the Special Tariff over years of operations.
- they foresee other costs in the door-to-door transport chain. The last-mile transport will involve much waiting time, which is costly.
- it will be essential that the rail transport services are well planned and that schedules are kept. Logistics companies are skeptical about that, because RZD (or railways in general) has no good track record on this issue.
- they have worries about damages to their vehicles (semi-trailers), because of the handlings in the terminal. There could also be severe damage during the railway leg if the vehicle is not well tied to the wagon.
- they have worries about the security of cargo. In road traffic the driver is continuously together with his cargo and even there incidents of theft happen. In Piggyback Transport there will be less control, even in accompanies Rolling Highways. Train sets will have intermediate stops which makes them vulnerable.
- related to the previous issues, there are worries about liability. If the vehicle is damaged or cargo misses responsibilty should be with the provider of the piggyback service. Companies expect however that RZD is not willing to accept liability and that handling of claims will become a time and resource consuming process with low expectation of success.
- there are worries about border procedures and disbelief that there will be effective special arrangements that would assure swift border crossing. Moreover, with 30 trucks on a train the occurrence of irregularities (or customs officers holding the train for alleged irregularities) will become likely. There will be no driver around to resolve the issue. It may also be technically impossible to unload or decouple and stall the wagon at the border.
- using the unaccompanied piggyback transport service requires arranging for road transport from end terminal to consignee. Selecting and entering into a contract with a competent and trustworthy road transport partner for carrying out that transport will take time and resources. Compared to road transport, unaccompanied transport is complex from organizational viewpoint and needs more administrative effort. It can be interesting for companies which would be using it regularly, but only if overall savings can be significant.
- none of these potential clients expected to become client of the service, would it be there, because of all these concerns.

The response is too small to have any representativeness, but still this response must be considered to be worrying. Those involved in developing of the strategy for piggyback could also not disclose names of companies or representative institutions from the logistics sector who had expressed need or demand. This reveals that marketing of the service so far has
been omitted and will need much attention. Like for RZD, shifting the cargo from road to railways will be a major effort for clients for which they will need to anticipate on.

5.4.3. Business models for offering the Piggyback Transport Service

The developers are confident in the system, provided that the request for special railway tariffs and swift border crossings can be arranged, because of the assumed economies of scale. Calculations and comparisons with road transport however revealed that the competitiveness of piggyback services is unconvincing at best. With all political measures like road infrastructure charges in Russia together with changing market conditions like increase in fuel prices or wage levels and border delay times in road transport piggyback transport on the Moscow – Helsinki corridor could become on a par with road transport. Exemption rules for vehicle weight (44 ton) would then create a good competitive position for the heavier cargo. The conclusion therefore is that yet there is no viable business case for piggyback transport between Bely Rast and Kouvola.

In the case that there would be a viable business case there are still issues to be resolved:

- a business model should be decided or should emerge.
- initial investments are needed for rolling stock and for infrastructure and equipment in terminals. There are also initial business costs, like those of marketing the service, training of terminal staff and setting up an ICT-system and possibly a system of wagon or cargo monitoring. Funding of these will depend on the business model.

In extreme, there are two principle business models, each with variants of implementation. In the first business model the Piggyback Service will be provided by RZD and RZD bear its commercial risk. In the other model other companies will bear the commercial risk and RZD will be hired as traction provider in Russia. A third model would be a mix of these, in which commercial risks are shared.

If RZD is taking the commercial risk RZD will

- be arranging all operations of the chain. RZD will establish a contract with VR for railway and terminal operations in Finland, which will have to include agreement on operational and management procedures, e.g. in case of delays. Such agreement is also needed with the terminal operator in Russia, if not in own hands.
- be exploiter of the wagon fleet and therefore acquire, maintain and repair it.
- be responsible for marketing the service, contracting with clients and its administering.
- provide access to pre- and endhaulage services and possibly involve in it with own truck-trailers and drivers.
- need to assume liability of the full part of the chain (terminal-to-terminal or more) which it provides its services for.

Option for the international service is to have the risk shared between RZD and VR. It would in particular be an advantage for marketing and chain management. The latter has had a long presence in the Finish market and is likely to have easier access to the market players in Finland.

The market may perceive RZD’s (and VR’s) provision of pre- and endhaulage services as welcome additional services, but others may perceive it as threat. Ownership and
exploitation of an own truck fleet will put the railway companies in the position to provide full door-to-door services and thus in competition with the road-based logistics companies. These logistics companies, which are target market of the piggyback services, may be deterred because they consider the piggyback-service as competitor, not as service provider.

In the other business model RZD and VR restrain themselves to operational tasks: railway traction and possibly terminal handlings as well. A third party, the “piggyback transport operator” will assume all commercial risks and thus all of the other tasks listed above and will book and pay a fixed amount for the traction services. The piggyback transport operator can be a single company, but more likely it will be a joint-venture between players in the logistics market and possibly a “private railway company” which will own the wagon stock and a terminal operator.

This model is more solid. The joint-venture will have better connections to the market and (financial) commitment of the partners would immediately provide base load for the service and make it viable. In other words, in this model the piggyback service is borne by the market players that have access to cargo.

A mix of the two models, i.e. sharing the risk between the railway companies and other companies from the logistics sector, would be the intermediate option. The role division would be most alike the second model however with the difference that RZD will have to share in the loss in times that demand falls short.

The fact that strategy development in Concept-1520 has been a railway venture suggests that RZD envisages the first business model, however also the second model and the model of risk sharing are still kept as options. Whichever way, there is still a tremendous amount of work to be done:

- the first model requires great marketing effort. Paragraph 5.4.2 described the skepticism from the potential clients and this needs to be overcome. RZD will need to convince clients of the advantages of the service and of its trustworthiness
- the second model would logically emerge from initiatives from the demand side, of which however until now has been no sign.
- the model in which commercial risk will be shared seems to be the most achievable and desirable for a sustainable supply of piggyback services.

5.4.4. Investment need

The investments needed for the piggyback service between Moscow and Helsinki are:

- a new terminal in Bely Rast. RZD estimated the investment sum of its template design at about €65 million. The Bely Rast terminal will be a hub terminal and will facilitate this but many other Piggyback services as well.
- an upgrade of the terminal in Kouvol which must provide side access to the train. The estimated investment sum is €2 million. This investment is dedicated to this particular service only.
- an investment in wagons. Concept-1520 calculated that the frequency of 2 trains per day would require a fleet of 268 freight wagons, which would amount to an investment sum of about €20 million.
• 8 passenger wagons. These are needed if also Rolling Highway services will be offered. It is not clear whether this rolling stock is already widely available in RZD’s fleet. If not, investment sum would be around €8 million.
• traction units. For the new activity RZD should expand its fleet, initially by 3 or 4 locomotives, implying an investment of between €8 and €11 million.
• investments in terminal equipment: MAFI’s (6 in Bely Rast, 2 in Kouvola) for horizontal transshipment and reach stackers (1 in Bely Rast and 1 in Kouvola) for vertical transshipment. Sums are estimated at 30,000 per MAFI and €300,000 for a reach stacker.
• investments in Information and Communication Technology (ICT). This concerns at least a booking, administration and invoicing system, but most likely customers of this new service will e.g. require possibilities of monitoring the trip, which requires extra devices and software.
• investment in road transport equipment (truck-trailers) if the combined transport or terminal operator wants to offer pre- and endhaulage services to its client. Concept-1520 proposed 20 for the standard terminal, estimated at €1.5 million.

The investments in terminals which concern infrastructure would typically be a public investment, but full or partly retrieval from its users would be fair and consistent with infrastructure funding elsewhere. Full retrieval of the investment from its user is a possibility for the terminal in Kouvola: with a levy of €10 for each ILU the investment would be earned back within approximately 9 years, (when assuming the service frequency as in Concept-1520 and an interest rate of 8%). For Bely Rast such full retrieval from users is not realistic, even not when considering that the terminal is shared between service connections with other terminals, because the levy would need to be too high. Other forms of private sector participation (or public-private-partnership) in Bely Rast are conceivable because the terminal will be integrated into a logistics park with a wider purpose than piggyback transport. There will be synergies between the terminal and the logistics zone and e.g. parking and service facilities can be shared, while the presence of the combined transport hub will increase the attractiveness of the area for business entities to settle.

The investment in wagons will be earned back during their operations, but the initial investment need for this service is quite demanding. (It should be noted that alongside this investment, Concept-1520 suggests that also several other service connections will be launched in a timespan of a few years.) In the business model in which the commercial risk is left to or shared with the users of the piggyback services, also these investments may be shared with users raising (part of) the capital. The same investment sharing could be with the ICT-system will be earned back during operations.

The terminal operator will be responsible for the investment in terminal equipment. For the hub terminal Bely Rast it will be most appropriate to have terminal operations in the hands of a single terminal operating company which is independent of the combined transport operators. For a public terminal it is important that any combined transport operator and road haulier can expect equal treatment when using the terminal. The regional terminal in Kouvola, as regional terminal with few transport connections, can be operated either by the combined transport operator or by VR. All investments in terminal equipment will need to be retrieved from its operations.
Apart from these investments there will be other business costs which would need to be considered particularly for the initial years of business, like the recruitment and training of terminal staff, the promotion of the service, targeted marketing efforts and contracting costs. Also it will take time for the service to become profitable. Revenues in the first year(s) of operation will be below break-even, because the market will still needs to get confident of the advantages of the services. Since it is a new type of service, many of these clients will be cautious.

Concept-1520 proposes to schedule a frequent piggyback service from the beginning. A slower pace of introduction will reduce much of the risks involved in the introduction. It will spread the investments in rolling stock and in terminal equipment over multiple years and the losses inherited from the initial low utilization rates can be contained. It will also give time to learn from shortcomings which will expectedly emerge once in operation since it concerns a completely new type of business to all players involved.

The common practice in the European Union for long-distance services to newly served areas is to start with a frequency of 2 or 3 departures per week and then gradually expand it to a daily service, when demand allows. Such cautious approach would only need 2 wagon sets and 1 additional locomotive at the start. Much more could be saved if the service would start for unaccompanied transport, leaving out the passenger wagon. Initial investment in rolling stock would be about €8 million, instead of €38 million. Less ambitious terminal handling speeds could bring additional savings in investment in terminal equipment and in staffing. For an infrequent use of the reach-stacker in the initial years, second hand equipment will fulfill.

5.5. Social benefits of the piggyback service

The piggyback transport service is desirable from societal viewpoint because of its social benefits:

- The proposed service will be an improvement to the current practice of poor efficiency and quality of transport services. This can enhance trade between South and West Finland on one side and Moscow on the other.
- The service will add capacity to long-distance freight transport at relatively low investment costs. With the frequency of 2 trains per day this was estimated at 15% of the freight demand.
- The service will be an alternative to road transport with lower negative impacts to the environment. A shift of cargo from road to piggyback will reduce fuel consumption and because of that also will reduce the emissions of CO2 and polluting gases.
- Rail also has better performance on traffic safety.

Table 15 expresses this reduction of negative impacts of transport in monetary terms. The calculation uses the methodology and the parameters as applied in the standardized calculator of European Union’s Marco Polo-program. The purpose of that calculator is to quantify external benefits of a modal shift from road to intermodal transport in order to evaluate value for money of their grants. The parameters in that calculator are accepted in the Program and by EC as adequate market averages.
The table shows significant external costs of transport. A roundtrip by road has a market price (internal costs) of about €1900 while its (unpaid) costs to the environment are €642 (assuming that the trucks return trip is empty). If piggyback would be used for such round trip external costs would be €232, while market price would be €2360. Therefore, if all environmental costs would be included in transport prices (so-called internalisation of external costs) road and door-to-door piggyback transport costs would be about equal.

It is important to note is that variances around average emissions can be substantial and, like in business costing of piggyback transport, much depends on how exactly the transport chain is composed. Short pre- and end-haul distances for example will further reduce external costs of combined transport, while more deadweight on the train (rolling highway) will offset part of the advantage. Also important is that the external costing assumes as certain monetary valuation of the external impacts of transport. The costs attributed to air pollution are likely to be different between European Union and the Russian Federation because of differences in income levels and health care costs. Meanwhile, CO2-emission have impacts on climate change, which is a worldwide phenomenon and its valuation follows universal costing principles.

Whatever way however, the comparison does show that a successful shift of freight transport from road transport to piggyback transport will produce evident social benefits because of its lower environmental burden.

### 5.6. Funding possibilities

The aggregate analysis of competitiveness in 5.3.4 concluded that the proposed piggyback transport services would not be competitive under current market conditions. This however does not exclude the possibility of viable combined transport services. If market players create solutions which seamlessly integrate combined transport in their logistics systems, for example with warehouses adjacent to terminals, costs and pre- and end-haulage can be minimised. This realigning of their logistics may reduce logistics costs elsewhere in the supply chain or increase overall supply chain quality, e.g. by improved timing of deliveries. Moreover, market conditions (in particular road transport prices) may change over time by policy measures (taxation) or e.g. by increased wages or fuel prices.
The development of transport services is the domain of the market players in the transport sector. Combined transport services which are economic viable will be able to attract investment capital from own means or commercial banks.

The social benefits described in the previous paragraph go beyond the boundaries of the business entities which are involved in the provision of services and therefore commonly are not accounted for if capital is attracted from these sources. For such purpose, International Financial Institutions (IFI) may be involved. The IFI with potential interest in such project in this region are:

- the Nordic Investment Bank (NIB);
- the European Investment Bank (EIB);
- the European Bank for Reconstruction and Development (EBRD);
- the World Bank (WB).

All these IFI have overall objectives of enhancing regional development, improving efficiency and competitiveness and promoting sustainability of business. And all IFI in particular co-fund projects which have a longer-term perspective, which in practice tend to face more difficulties of attracting commercial loans.

For the piggyback service NIB is an obvious candidate, since NIB’s main geographical focus is the Northern Dimension Region and NIB participates in NDPTL. NIB also has expressed that it wants to put emphasis on financing the integration of freight transport modes and promote the use of environment-friendly technologies in this area. An example of a logistical project eligible for NIB financing would be intermodal logistical centres or hubs. EIB, EBRD and WB also have experience in the co-funding of rolling stock procurement, next to their co-funding of logistics nodes.

What would be needed first for attracting funds of NIB or other IFI is proof of a viable business case and initiators would need to present:

- a more precise assessment of demand. The current assessment uses rudimentary assumptions which should be refined. For example it should be verified whether the assumption that 25% of current border crossing trucks being is the relevant market of the service. It will also have to include a forecast of demand development.
- a projection of this demand on the utilization of the rolling stock, terminal equipment and infrastructure over time.
- more advancement in the marketing of the service and evidence that there is actual interest from potential clients in using the services that will be offered, preferably with clear commitments to paired investments by future clients.
- a longer run perspective of business revenues, costs and cash flows. It should be plausible that competitiveness (lower service production costs than road) and tariffs can sustain.
- an assessment of business risks and risks that the project’s full potential will not be realised and of contingency and mitigating measures.
- a quantitative assessment of social benefits, like those of reduced environmental costs of shifting cargo from road to piggyback transport.

For projects, IFI would typically co-fund e.g. up to 35 per cent of the total project cost. That means that other sources of funding, e.g. by own capital, also need to be identified.
The NDPTL-Support Fund can provide up to 50% co-funding for the costs of preparatory studies for making a project bankable. Developing a solid business case for the IFI’s requires a lot of work and for example includes environmental issues to be clearly documented. NDPTL established the Support Fund in 2013. It is available to NDPTL Member States and to public and private undertakings with the agreement of the Member States concerned. Projects should have cross-border impacts and priority is given to projects on the NDPTL Regional Transport Network. The NDPTL-website (ndptl.org) provides guidance for applicants.

Two co-funding instruments on European Union level could be relevant in theory as well:

- the Marco-Polo Program, which co-funds start-ups of intermodal transport services. The program supports the initial loss-giving years of intermodal transport services, provided that they will be viable without public support after maximum 3 years and that these services do not attract cargo from other combined transport services.
- TEN-T (Trans-European Network for Transport) which co-funds up to 10% of infrastructure projects of common interest that contribute to the program’s objectives. (So-called priority projects can have higher contributions.)

Both programs can support cross-border projects, however only for as far they are on EU-territory and only for business entities registered in EU Member States. For Marco-Polo funding that means that only the 90 kilometer distance of railway transport on Finnish territory will be eligible. For TEN-T only the investment in the Kouvola terminal will be relevant.

Both programs apply threshold values for intervention. Marco Polo only supports modal shift to railways if it concerns at least an average of 60 million ton-kilometers on European Union Territory. It is not realistic that this threshold will be achieved, even not with a frequency of 2 services per day. Extra complication will be that the calculation must include pre- and endhaulage distances in Finland, which will further reduce the net modal shift. TEN-T’s minimum grant is €500,000, and with 10% subsidy this implies a minimum investment budget of €5 million. The investment need for the Kouvola terminal is only of €2 million.

Moreover, like IFI both programs will only co-fund investments of which long-run viability is demonstrated and in projects which are well-defined and ready to start.
6. Legal issues

6.1. Legal framework for combined transport

6.1.1. Piggyback transport in legislation

There is no formalized legal definition of piggyback transport, neither in the European Union nor in the Customs Union. For the purpose of this study project we adopted a working definition of piggyback transport “transport of semi-trailers or of trucks on top of railway wagons as part of a multimodal chain”, as is described in Chapter 1. In this report we also consider carriage of containers and swap bodies because also RZD’s Concept-1520 took this wider notion, even though use of these intermodal loading units was not RZD’s prime aim. Common technical term for this widened concept is combined transport or intermodal transport.

The particularity of piggyback transport lies in its nature. During the road part of the route, trucks and semi-trailers are means of transport, but they should be considered as package during the railway leg of the route. The overlapping of road and railway legislation under the ‘piggyback’ transportation leads to the complexity in liability regime determination and in customs paper work. Meanwhile containers and swap bodies are package during the complete door-to-door combined transport chain.

6.1.2. Combined Transport in European Union legislation

In the European Union, the combined transport (for international transport) is defined in the Council Directive 92/106/EEC of 7 December 1992 on the establishment of common rules for certain types of combined transport of goods between Member States. It defines combined transport as the transport of goods where the vehicle uses the road on the initial or final leg of the journey and, on the other leg, rail or inland waterway or maritime services where this section exceeds 100 km as the crow flies and makes the initial or final road transport leg of the journey:

- between the point where the goods are loaded and the nearest suitable rail loading station for the initial leg and between the nearest suitable rail unloading stations and the point where the goods are unloaded for the final leg, or
- within a radius not exceeding 150 km as the crow flies from the inland waterway port or seaport of loading or unloading.

The transport document to be provided in the case of combined transport must specify the rail loading and unloading stations relating to the rail leg.

The pre and/or end haulage transport by road must be an integral part of the combined transport operation and may or may not include the crossing of a frontier. This transport by road may be carried out by any licensed international road haulier, or, if it concerns own account operations, by the receiving or dispatching undertaking.

The Directive encourages Member States to have road vehicles routed in combined transport exempted from vehicle tax obligations.
6.1.3. Combined Transport in Customs Union legislation

In Customs Union countries no legal definitions of combined transport exist and therefore there is no legal framework for regulating this market segment. This gap was recognized in the Concept-1520 and draft legislation is in the pipeline for adoption.

In Concept-1520 RZD experts wrote down the list of international and national agreements, laws and regulations which should be adopted or amended for the proper fulfilment of Concept-1520. The list presents the “ultimate picture” of the legal framework in Russia for combined transport. The most important legal normative documents which need to be adopted, revised or amended were listed in the chapter “Legislative Environment” of Concept-1520. These are on Federal level:

- Federal Law (draft) “On direct multimodal (combined) transport”;
- Federal Law (draft) “On transit”;
- Federal Law of 24th July, 1998 No.127 “On governmental control under the international road carriages and on liability of infringement their fulfilment”;

The draft Federal Law “On direct multimodal (combined) transport” was prepared in 2006 but still has not been adopted. The exact contents were not available, however was said to have similar objectives as Directive 92/106/EEC and will establish common rules for combined transportation.

The regulatory challenges on sector level are dealt with by the Ministry of Transport and RZD. These are:

- Rules on operation of Russian railways;
- Price list No. 10-01 “Tariffs for cargo carriages and infrastructure services...”;
- Rules and technical standards for the design of stations and junctions on the 1520 mm railways gauge”;
- Rules for the carriages of tractors by railway transport (in version of Orders of 18th December, 2001 No.50 and of 6th December, 2001 No.47);
- Order of the Communication Lines Ministry of Russian Federation of 29th May, 2002 No.26 “On approval of the Typical scheme of order for individuals, cargoes, goods and animals crossing through the State Russian Federation border under the international railway transport” (registered at the Ministry of Justice of Russian Federation of 14th August, 2002 No. 3691);
- Manual for the carriage of outsized and overweight cargoes by CIS-countries, Latvian, Lithuanian and Estonian railways” (No. DCH-1835).

On Departmental level (Federal Transport Service, Ministry of Internal Affairs, others) the needs for amendments are in:
• “Rules on road traffic of Russian Federation” approved by Governmental Regulation of 23th October, 1993 No.1090;
• “Main provisions on the vehicle access to operation and official’s duties for providing the road traffic safety” approved by Regulation of Council of Ministers – Government of Russian Federation of 23th October, 1993 No.1090;
• Interim Technology for the transportation of cargo in trailer under the customs control (contemporary customs transit regime);
• Order of State Customs Committee No.373 concerning the delivery of cargo from Russia sea ports under customs control;
• Governmental Regulation of 20th November, 2008 No.872 “On approval of Rules for the control in the State Russian Federation border crossing points”.

6.2. International coordination of combined transport development: AGTC

Despite its weak formal inclusion in international and national legislation, countries recognized that combined transport could take up a vital role in international transport and in achieving common objectives of transport policies, like reducing the environmental burden, improving safety and increasing transport efficiency. The UNECE Economic Commission for Europe of the United Nations set up a working group with the purpose of establishing coordination in the international development and operation of an "international combined transport network".

That working group launched the Agreement on Important International Combined Transport Lines and Related Installations (AGTC). The AGTC entered into force in 1993. All NDPTL countries except Estonia and Sweden are contracting parties of the Agreement.

The AGTC network consists of important international combined transport lines and related installations, which AGTC-partners intend to undertake within the framework of national programmes. The AGTC lists these railway lines, its relevant terminals, border crossing points, ferry links and other installations important for international combined transport services. The list includes for example the railway lines and border crossing relevant to the pilot Moscow – Helsinki. It also establishes internationally acceptable infrastructure standards for those lines and installations, and prescribes internationally acceptable performance parameters of trains and combined transport installations and equipment.

The AGTC is a guideline, meant for international coordination purposes and it does not concern legally binding commitments.

6.3. Combined transport and liability regimes

An important issue in combined transport concerns the issue of liability. Freight transport carrier liability systems have developed along uni-modal lines with CMR being the regime of road transport, Hague-Visby for maritime and COTIF/CIM and SMGS for railway transport. This uni-modal reflected that freight was mainly moved on a uni-modal basis, but is has become unsatisfactory since freight transport movements have increasingly become a part of a transport supply chain which often involves multiple transport means.
6.3.1. CMR: Convention on the Contract for the International Carriage of Goods by Road

The CMR Convention was devised by the UNECE and agreed on in 1956 and became operative in 1961. CMR has been ratified by most countries in Europe as well as over almost all states of CIS. The Convention applies to all movements of goods by a road vehicle for reward or hire which crosses international borders where at least one of the countries is a signatory to or has acceded to the Convention.

Road contracts should be confirmed by the issue of a CMR consignment note, which must show the name and address of the consignee, consignor and carrier; a description of the goods; weight and number of packages, etc. It is important to note that, under the CMR, the appropriate consignment note is not a document of title but it has great value as evidence and copies of the note should ideally be retained for at least one year.

Under CMR, the carrier is liable for the total or partial loss of or damage to the goods between the time when he takes over the goods and delivery, as well as for any delay in delivery. The carrier is relieved of liability if the loss or damage was caused by:

- a wrong act or neglect on the part of the claimant;
- inherent vice;
- defective packing;
- loading or unloading carried out by a third party;
- circumstances which the carrier could not avoid and consequences which he was unable to prevent.

Compensation is calculated in relation to the value of the goods at that time and place at which they were accepted for carriage and the value is based either on the commodity or market price or, where there is no such price, the normal value of similar goods. Most Western European states have ratified a Protocol to the CMR which introduces compensation limits of 8.33 SDR (Special Drawing Rights; 1 SDR is about €0.87 in June 2013) per kilo of gross weight of the goods lost or damaged. If the goods are not delivered within 30 days of an agreed time-limit, or in any other case within 60 days, a claimant can treat the goods as lost and claim compensation.

CMR will continue to apply to the entire transit, if the vehicle containing the goods is transported over part of the route by rail and the goods are not unloaded from the road vehicle. However, if the goods are lost, damaged, or delayed while the vehicle is being carried by the other mode of transport by an event which could only occur through use of that other mode, the liability of the road carrier will be determined by any national or international mandatory law applicable to that other mode. If there is no such mandatory law, the terms of the CMR will continue to apply. However, it has appeared that the interpretation of the Convention and the decisions of the courts in different countries are not always the same. This led to an increase in what is called “forum shopping” or bringing an action in a country where the most favourable outcome may obtained.

6.3.2. COTIF: Convention Concerning International Carriage by Rail (EU)

With the entry into force of the COTIF in 1980 the Intergovernmental Organization for International Carriage by Rail (OTIF) was born. The aim of the OTIF is to promote, improve and facilitate international traffic by rail. In order to achieve this, a uniform system of law is
established and support is given to applying and developing it. The uniform rules currently applicable to international carriage by rail are contained in 7 Appendices to COTIF:

A. CIV: Uniform Rules concerning the Contract of International Carriage of Passenger by Rail
B. CIM: Uniform Rules concerning the Contract of International Carriage of Goods by Rail
C. RID: Regulation concerning the International Carriage of Dangerous Goods by Rail
D. CUV: Uniform Rules concerning Contract of Use of Vehicles in International Rail Traffic
E. CUI: Uniform Rules concerning the Contract of Use of Infrastructure in International Rail Traffic
F. APTU: Uniform Rules concerning the Validation of Technical Standards and the Adoption of Uniform Technical Prescriptions applicable to Railway Material intended to be used in International Traffic
G. ATMF: Uniform Rules concerning the Technical Admission of Railway Material used in International Traffic

The Vilnius Protocol, signed in 1999, comprises an in-depth revision of the COTIF and all its appendices.

COTIF members are mostly European Union Member States, but also some North African States and States from the Middle East have ratified the Convention. Sweden has not yet ratified COTIF and Estonia only ratified CIM, which is the relevant Appendix for international goods transport. Also Russia ratified COTIF-CIM, however only for a limited part of its routes. Belarus does not participate in any kind of OTIF activity.

The CIM Rules (COTIF - Appendix B) apply to a contract of carriage by rail if the place of taking in charge of goods and the designated place of delivery are situated in two different states, of which at least one is party to CIM Convention and the parties to the contract agree that the contract is subject to the CIM Rules. According to Articles 1 (3) and (4), CIM Rules would also apply to an international carriage that includes carriage by road (or inland waterways or sea) as a supplement to cross-border carriage by rail, if the respective carriages are performed are subject to a single contract of carriage.

CIM Rules establish transit periods which should not exceed 24 hours for each 400 km distance of carriage and 12 hours for consignment. (For less than wagon-load consignments this is 200 km and 24 hours respectively. These transit times can be overruled by mutual agreement.

The CIM provides for liability of the carrier. The carrier shall be liable for loss or damage to the goods between the time of taking over of the goods and the time of delivery. The carrier shall also be liable for the loss or damage resulting from the transit period being exceeded. The burden of proving that the loss, damage or exceeding of the transit period lies on the carrier.

COTIF-CIM assigns compensation rates for carrier. In case of total or partial loss of the goods, the carrier must pay compensation calculated according to the commodity exchange quotation. If there is no such quotation, compensation will be according to the current market price, or else according to the usual value of goods of the same kind and quality on the day and at the place where the goods were taken over. Compensation shall not exceed 17 SDR per kilogram gross weight. Compensation for delays shall not exceed four times the carriage charge.
6.3.3. SMGS Agreement on International Freight Traffic by Rail (CU)

SMGS was established in 1951 and revised in 1953 by eight Eastern European countries. For its fulfilment the Organization for Railways Cooperation (OSJD) was established in 1956. At present time 27 countries, including such EU-members as Bulgaria, Latvia, Lithuania, Estonia, Poland, Romania, Slovakia, Czech as well as CIS-countries with Russia and Belarus, participate in OSJD activities. Six railways authorities of West-European countries are observers: German DB, Finnish VR Group, French SNCF, Greek OCE, Serbian and GYSEV-Raaberbohn.

SMGS regulates all issues concerning international freight transportations by rail related to clients and railways. Its Regulations cover frameworks of carriage contract, railways liability as well as fare payments, mutual settlements, tariffs, etc. The Agreement also contains some specific provisions, such as:

- rules for the cargo carriage accompanying by consignee or consignor guide;
- rules for the perishable goods carriage;
- rules for the container carriage;
- rules for the carriage of goods on pallets;
- rules for the carriage of wagons not belonging to railways;
- rules for the carriage of goods in transport package.

Under the SMGS conditions and on the basis of inter-railways agreements the Single Transit Tariff is established. The Agreement also stipulates the special SMGS consignment note, which determines term of cargo delivery and certify cargo acceptance for transportation.

SMGS consignment note differs from CIM consignment note. It has five pages. The first page of the SMGS consignment note is original and should be handed together with cargo and the fifth page to the consignee. Only this first page has legal validity. The second page is a railway memorandum bill (leaves at station of destination), the third a duplicate of consignment note for the consignor and the forth is a copy for cargo transferring which must accompany the cargo till the station of destination. The fifth page is a notice on cargo receipt.

The SMGS consignment note must be issued for each departure and for each shipment which should be at least one wagonload or one intermodal loading unit, like a container. Mixing cargo from different departure or arrival stations on one wagon is prohibited.

SMGS’s terms of delivery are 200 km per day under the low-speed and 320 km per day under the high-speed delivery. The compensation rate for delayed delivery fluctuates between 6 and 30% of the transportation charge. The compensation rates are in accordance with declared value or within the actual value specified by consignor. SMGS does not define a maximum level of liability, as COTIF does.

Meetings revealed that amendments to the SMGS agreement are under preparation by a project commissioned by RZD and conducted by Deutsche Bahn International (DBI).

Of particular interest are the amendments concerning the introduction of an additional page to the SMGS Consignment Note. The “Additional Sheet” will formalise the use of semi-

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trailers and trucks as loading units and establishes an appropriate documental legal environment for piggyback transport in a similar way as already available for container consignments. If a piggyback train will consist of a mix of “piggyback units” (trucks, semi-trailers) and containers it will be necessary to formalize containers by separate SMGS consignment note and to formalize piggyback units by another separate SMGS document.

The recommendations of the project will be presented to the Interim Working Group of OSJD Committee in 2013 for further implementation into SMGS Agreement.

6.3.4. CIM/SMGS for EU-CU railway transport

The COTIF-1999 provides a contractual solution which allows rail freight transport between Member States of COTIF and non-Member States to be carried out under a single legal regime. The parties to the contract of carriage may specifically agree that the contract is subject to CIM, even if one of either the country where goods are handed over for carriage or the country of delivery is not Contracting Party of COTIF- CIM.

Alternatively, in 2006 the CIM/SMGS consignment note became available. The use of CIM/SMGS consignment note is presumed if they have been agreed between customer and carrier as well as between the carriers themselves. The creation and approval of that single document has proven to be a real advantage and has overcome numerous barriers in international trade facilitation for the countries bordering the two different regimes.

6.3.5. Efforts for Multimodal liability

The recognition of the increasing practice of combining transport modes into one transport chains prompted the Convention on International Multimodal Transport of Goods (CMT) in 1980. CMT, developed by the United Nations, aim was to establish a mandatory uniform carrier liability system which envisages the issuance of one transport document for the entire transport chain and for the liability of the Multimodal Transport Operator (MTO) to cover the whole period during which he is in charge of the goods. Even though the deliberations on the Convention were attended by representatives of more than 80 States, 15 specialized agencies and intergovernmental organizations and 11 non-governmental organizations, and the Final Act of the Conference was signed by approximately 70 States, including many of the major shipping countries, it still failed to enter into force due to an insufficient number of ratifications.

A substitute emerged in the form of the ICC Uniform Rules for a combined transport document (URC). These gained worldwide recognition and have been incorporated into several widely used standard documents, such as the FIATA (aviation) combined transport Bill of Lading. In 1992 they were replaced by another set of successful contractual provisions for multimodal transport documents; the UNCTAD/ICC Rules, which are based on Hague Rules and Hague-Visby Rules as well as existing documents such as the FBL and the ICC Uniform Rules. These Rules did not reach the status of mandatory international legislation. They give the impression of simplicity, but they cannot set aside the compulsory rules of international conventions. The result is a remaining uncertainty in terms of liability and legal position. The Rules apply when they are incorporated into a contract of carriage by reference to the “UNCTAD/ICC Rules for multimodal transport documents”, however only cover part of the customary contents of a multimodal transport contract. Thus, a multimodal carrier wishing to use the Rules as a basis for his multimodal transport contract would still
have to add other clauses dealing with matters such as jurisdiction, arbitration and applicable law, to satisfy his particular needs.

Market initiative was by the International Union for Road-Rail Combined Transport (UIRR). UIRR, an association of 17 European Combined Transport operators, developed standard carriage conditions which must eliminate the ambiguities in liability. The single Multimodal Transport document, the CIM/UIRR Consignment Note, also available as e-document, must facilitate all types of combined transport in Europe for its member companies. UIRR-companies accept carrier liability in accordance with CIM rules for the railway leg (up to 17 SDR per kg) and CMR (up to 8.33 SDR per kg) for other parts of the transport chain, up to a value of 300,000 SDR per ILU and 2 million SDR per event. Liability concerns vehicle and cargo.

The lack of a single liability regime creates uncertainty with clients and transport operators. One multimodal chain may entail different uni-modal regimes, possibly different railway conventions as well and different legal regimes in international transport. In addition to regimes various standard term contracts created by the industry may apply as well. The main problem concerning the unpredictability is financial in nature. Often due to the uncertainly of the applicable law the cargo claimant and the carrier are unable to anticipate the amount of compensation to be paid. Under these circumstances insurance costs tend to double, via cargo insurance by the consignor or consignee and via liability insurance by the carrier. Obviously these so-called friction costs are deemed undesirable by both parties.

6.4. Customs issues

Cross-border transport between countries of the European Union and of the Customs Union is transport between two economic areas which have eliminated their internal customs borders and non-tariff barriers, for example the time that it takes to clear goods at borders. As a consequence all trade between countries will only be subjected to Customs Procedures when passing the external borders between the Customs Union and European Union. Customs tasks for this trade still comprise the collecting of customs duties and VAT.

The Customs Code of Customs Union was approved in 2010 and fixed customs-approved treatment similar to the existing in EU. Both in EU and CU release for free circulation provides for obligatory customs payment. Thus, for “Export” use of goods all customs payments should be prepaid. “Transit” customs-approved treatment stipulates movement of cargoes under customs control without customs duties payment, notably with deferral of payments. Both EU and CU customs legislation provide for the “Bonded Warehouse” use of goods which allow storing goods without customs payments up to 3 years in accordance with CU’s Customs Code and termless in accordance with EU customs legislation.

For the scope of the “EU/CU piggyback transport project” there are no barriers on customs issues. Procedures on customs clearance could be made in the logistics terminals situated on the final end of piggyback route.

All countries in CU and EU ratified the Customs Convention on the International Transport of Goods under cover of TIR Carnets (or TIR Convention). The Convention entered into force in
1978 and replaced the older 1959 TIR Convention. The purpose of the TIR system is to facilitate to the greatest possible extent the movement of goods in international trade while effectively protecting the revenue of each State through which such goods are carried.

The TIR system contains five basic requirements:
1. Goods must travel in secure vehicles or containers;
2. Duties and taxes at risk throughout the journey must be covered by an internationally valid guarantee;
3. The goods must be accompanied by a TIR Carnet opened in the country of departure which will serve as a control document in the countries of departure, transit and destination;
4. Customs control measures taken in the country of departure should be accepted by the countries of transit and destination; and
5. Only competent national authorities shall authorize national associations to issue TIR Carnets and natural and legal persons to use TIR Carnets.

The system provides for the movement of goods, under Customs seal, in approved road vehicles or containers, across one or more frontiers. A condition of the system is that some portion of the journey between the beginning and end of the TIR operation must be made by road. Where a road vehicle is used, TIR plates must be displayed on it during the TIR operation. Where a container is used it is used must have a TIR approval plate permanently affixed.

It is possible to use the TIR Carnet for combined transport as it provides for carriage of goods not only in power-driven road vehicles but also in semi-trailers and containers or other similar structures. In case a part of the journey is not made by road, the Convention states “... as long as some portion of the journey between the beginning and the end of a TIR transport is made by road, other modes of transport (railways, inland waterways, etc.) can be used. During a non-road leg, the holder of a TIR Carnet may either:
- ask the Customs authorities to suspend the TIR transport. In order to resume suspended TIR transport, Customs treatment and Customs control should be available at the end of non-road leg. If the whole part of the journey in the country of departure is not made by road, the TIR operation may start and be immediately certified as terminated at the Customs office of departure... Under these circumstances, no TIR guarantee is provided for the remainder of the journey inside this country. However, the TIR transport could be easily resumed at the Customs office situated at the end of the non-road leg in another Contracting Party; or
- use the TIR procedure. However, in this case the holder should take into account that a TIR operation in a given country may apply only in case the national Customs authorities are in a position to ensure the proper treatment of the TIR Carnet at the following points: entry, exit and destination.”

Most commonly applied is the first option. Customs handling should be done in the initial leg of the route. For simplifying of the customs handling in combined transport chains each of

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3 Federal Customs Service of the Russian Federation declared in June 2013 that it would pull out of the TIR-system because of alleged wide-scale violations of TIR-procedures. For now, the claim and the exit are strongly opposed by international business associations. Exit would have serious implications for all trade with Russia. Final decision is pending.
the customs authorities should agree on exchanging customs documentation in electronic forms.

In addition to the TIR Convention some other conventions concerning facilitation of border crossing should be mentioned. They were adopted in the UNECE frame and all NDPTL countries have acceded to it:

- Customs Convention on Containers, of 2 December 1972;

The Customs Convention on Containers provides conditions of temporary import of empty and loaded containers as well as determines design and marking of these containers. The International Convention on the Harmonization of Frontier Controls of Goods makes definitions of different types of control and also defines measures for the international road transport facilitation (in general phrases, not as a manual).

### 6.4.1. Authorized Economic Operator (AEO)

In European Union, economic operators can apply for the status of Authorised Economic Operators, which will recognize that it concerns a secure and reliable operator. AEO have easier access to customs simplifications and are in a more favourable position to comply with security requirements. Benefits of the AEO status are for example that the data set for entry and exit summary declarations is reduced, physical and document-based controls at the border are fewer and if selected for control there will be priority treatment.

The criteria for granting of an AEO for Customs include:

- a record of compliance with customs requirements,
- satisfactory system of managing commercial and, where appropriate, transport records, which allows appropriate customs controls; and
- proven financial solvency.

The status of authorised economic operator granted by one Member State will be recognised by the other Member States. The status of AEO can be granted to all stakeholders in the supply chain. That means that e.g. a forwarder or an agent at the premises of the consignee or at the terminal of departure on either end of the border can contribute to simplified customs procedures and swift border crossing.

Such institute of Authorized Economic Operator has recently been legally arranged in a similar way in the Customs Code of the Customs Union.

### 6.5. Legal issues influencing competitiveness

The policy environment in which road and combined transport operate will affect their competitiveness. EU States have implemented measures that intentionally improve the position of combined transport. Such measures are not yet available in CU States, which may be because there is no tradition of combined transport services. Other measures affect competitiveness unintended. This section provides an overview.
6.5.1. Charges to infrastructure use

European legislation regulates charges to heavy goods vehicles (above 3.5 tons gross weight) for the use of road transport infrastructure on the Trans-European Network for Transport. In EU’s Euro-Vignette Directive it authorizes Member States to apply charges and defines that charging principally is to cover user dependent maintenance works and may vary with cleanliness (Euro-norm) of the vehicles. Four EU-States (Denmark, Sweden, Poland and Lithuania) in the Northern Dimension region apply fixed annual charges for the use of their infrastructure, while Germany charges on the base of use through its distance dependent LKW-Maut. The other ND-States do not apply infrastructure charges to road hauliers.

EU also regulates charges for railway infrastructure use, based on similar principles than in road transport. All railway infrastructure managers in the ND-companies apply charges to the railway undertakings that use their infrastructure. States are free to decide on their own bases of their charges. They all are variable use dependent charges and commonly largely depend on gross train weights.

In Russia and Belarus payment systems for road transport are on the brink of introduction. Russian Federation adopted regulation for road charges to vehicles over 12 tons from January 2013 for the compensation of road damage. It concerns about 1.5 million vehicles which have total weight over 12 tons. Also Belarus introduced such system. Payment is between €0.04 and €0.12 Euro per km and depends on gross vehicle weight of vehicle and the number of axles. The charges apply to the motorways from Brest (border with EU) through Minsk to the Russian border and to some parts of internal roads. From 1st July 2013 the electronic toll collection system BelToll will start to operate for this purpose.

Charges to railway companies for the use of infrastructure are not explicitly defined in the CU countries. It is not clear to what extent infrastructure costs are included in the regulated tariffs of RZD.

6.5.2. Tax exemptions and other exemptions that benefit combined transport

Exemptions that can benefit competitiveness of combined transport concern:

- vehicle taxes. European Union combined transport legislation recommends that road vehicles which are used in combined transport chains are exempted from fiscal duties, including annual vehicle taxes and the charges for infrastructure use. This takes into consideration that combined transport reduces the burden on road infrastructure. None such legislation is in preparation yet for Customs Union countries.

- import duties. A way of promoting combined transport, possibly temporary for an initial period, is allowing import of combined transport terminal equipment and specialized rolling stock to be free of customs duties. This instrument however has not yet been considered by policy makers, neither in EU nor in CU.

- vehicle weights. Many countries in the European Union allow for extra maximum weights of vehicles that are used in combined transport. Many have maximum gross vehicle weights of 40 tons and allow for 44 tons for vehicles in pre- and end-haulage of combined transport chains. In 2010 Belarus adopted regulation that permits trailers with 40-foot ISO container, and semi-trailers usable for combined transport to have gross weights up to 44 tons, while 38 tons is its common maximum gross weight limit. Russia has not yet adopted such exemption.
• traffic bans. Commercial road transport is subject to restrictions for example aiming at limiting the number of heavy goods vehicles on roads at peak traffic periods. For example there are heavy goods vehicle bans in peak hours around Moscow. Exemptions for combined transport pick-up and delivery runs to and from terminals can be considered. Similarly these vehicles may be exempted from measures that aim at curbing noise from road vehicles driving at night.

6.5.3. Permit systems in international transport

Existing permit systems for road transport include short-term permits for bilateral, transit and from or to third countries carriages as well as CEMT long-term licenses issued for calendar years. Allocation of permits is determined by international bilateral agreements which have higher mandatory force than national regulations. This means that even partial carriage by road, like the end-haulage in international combined transport chains, requires a permit.

Central European countries apply partial revocation of the permit system for road vehicles which operate in combined transport chains. This may be considered in Northern Dimension countries as well. This would best be addressed by bilateral negotiation, since procedures for amending the system as whole will be complex and lengthy.

Liberalization and exemptions for combined transport could include:
• allowing cabotage to be used for terminal pick-up and delivery runs,
• granting users of combined transport exemptions from bilateral quotas and other restrictions on foreign transport operators,
• rewarding frequent users of combined transport services by granting them additional bilateral transport licenses. Such a reward scheme would have to take account of fact that, to be effective, additional licenses would have to be issued exceptionally to those who actually used the combined transport service.

Many countries have discussions about cancelling or liberalizing the permit system for bilateral and transit transportations. The market regulation is mainly to defend national haulier industries and many expect that liberalization can enhance international trade.

6.6. Experience of Viking service: legal and organizational issues

The “Viking” intermodal train started to operate in 2003 and was designed for the accompanying transportation of loaded trucks, semi-trailers and ISO- and special containers. It connects Lithuania, Belarus and Ukraine. After one year of operation it became a container shuttle service. In spite of that change, Viking can be a good example from which useful lessons can be drawn. This section focus is mostly on the legal aspects.

The route Klaipeda (Lithuania) – Minsk (Belarus) – Odessa/Ilyichevsk (Ukraine) over 1766km distance is covered in about 50 hours. From the beginning there has been agreement that customs handling should not take more than 2 hours at the Lithuanian/Belarusian border and 40 minutes at the Ukrainian/Belarusian border.

Common conditions for the operations of container trains were set in “United Agreement between Lithuanian, Belarusian and Ukrainian Railways on the organizational and
operational aspects of international combined transport” signed in April, 2002. It brought railways and customs authorities together with the aim of solving technical, legal and organizational issues. All understandings were fixed by the appropriate Protocols which became Amendments to the Agreement and thus obligations in law. Main elements of the Agreement are:

- all parties must undertake to attract cargoes for transportation;
- solid and competitive tariffs for the entire route must be determined annually;
- cross border procedures are simplified and preferential schedules for the shuttle train are ensured;
- transportation of goods under united invoice is accepted;
- united requirements for quality and efficiency of services are reached;
- railway forwarders are responsible for supplying cargo.

The contracting parties of the initial Agreement for the “Viking” train and sole authorized operators were:

- Lithuania: “LG Logistics” Lithuanian Railways department
- Belarus: “Belintertrans – transport logistic centre” state enterprise subordinated to Belarusian Railways
- Ukraine: State enterprise “LISKI”, “Transcontainer Ukraine Ltd.” and JSC “PLASKE”.

These authorized operators are responsible for the cooperation with clients, the preparation of the documents package, collecting of payments and distribute them among the railways and for information exchange with all customs bodies.

Border, customs and other controls were performed under the legal instructions of simplified border crossing. Preferential schedule of the shuttle and one-stop-shop solution were ensured and compatible IT systems KROVINYS, OPKIS, VPSKIS and their interface with Belarusian and Ukrainian IT systems improved the interaction and accelerated cross border procedures.

Along the entire route the SMGS regime applies. The SMGS consignment note also contains the Transit Customs Declarations, for which the regime “under customs transit” applies. For the carriage of road vehicles (truck-trailer or semi-trailer) the following documents (some is obligatory, some – in a case of necessity) had to be provided:

- CMR;
- Carnet TIR;
- Road Permit for international carriage;
- Packing List;
- Specification;
- Invoice;
- Customs Cargo Declaration (CCD);
- Preliminary CCD;
- Preliminary notice;
- Waybill;
- Quality Certificate;
- Quarantine Certificate (permit);
- Phyto-sanitary Certificate (permit);
- Sanitary Certificate (permit);
- Veterinary Certificate (permit);
- Ecological Certificate (permit, declaration);
- Certificate of origin;
- Act of customs check-out;
- Decision on goods code identification;
- SMGS consignment note.

The authorized operator will mark ‘accepted to delivery’ in SMGS consignment note as soon as the loading unit is passed on and from then the SMGS regime starts to apply. From that moment railways is responsible for the cargo and loading unit under SMGS limit of liability. Drivers accompanying their vehicles by train will have the status of freight forwarder or representative of cargo owner.

All interviewed persons in Lithuania and in Belarus underlined the importance of strong political promotion of the Viking train project.
7. Conclusions and recommendation

7.1. Conclusions from the pilot project

A piggyback transport services between Moscow and Helsinki would be welcome from a societal perspective. A significant shift of freight transport from the road to combined transport services will reduce the negative impacts of transport to the environment and improve traffic safety. A modal shift will also relieve road congestion, overall and at border crossings in particular and improve conditions for trade.

The evaluation of the pilot project learned that the proposed piggyback service will not be competitive in the current market conditions. This is a remarkable result, because in other European regions combined transport over such distances tends to have a competitive advantage. The cause of poor competitiveness in the pilot project is the low costs of road transport. By far most of this road transport is done by Russian drivers, contracted by either Finish or Russian companies, with low labour costs. Also the low fuel price in Russia is in the advantage of road transport. The tariffs that will be needed for a viable production of piggyback services will be significantly higher than the low tariffs of road transport.

A critical assumption in the calculation of piggyback costs is that RZD will provide special tariffs for its train traction services. These should be about one third of the standard tariff. The request for this special tariff, done be a working group in RZD, is realistic because the productivity (and thus efficiency) of RZD’s service provision will be far above average of the Russian railway system. RZD has not yet approved this lower tariff, but for the competitiveness of combined transport it is highly critical.

Improvements in the design of the service, e.g. using vertical instead of horizontal transshipment could also bring some savings, however not sufficiently significant. With a third railway traction provider (yet not feasible in Russia) there could be room for further decreasing the costs of providing the piggyback service, however also rather limited.

A serious weakness in the introduction of the concept is that piggyback so far has only been promoted within the railway community, but has not involved the road-based logistics sector, which is the target market. Ideal would be a business model in which the combined transport operation is a joint venture between railway and road companies. This would imply a commercial incentive and therefore a commitment of the road companies to using the service and providing a base-load. So far relevant market players from the demand side have mainly expressed skepticism. This gap between the service suppliers from the railway sector and the potential clients needs to be bridged already in the phase of service development, which will require a huge effort.

Overall one must conclude that the business case is poor and not mature. Meanwhile there is a high investment need at the beginning for developing terminals (from equipment), producing a wagon fleet, procuring locomotives and terminal equipment and of staffing. The initial investment can be tempered by a more cautious introduction with a lower frequency of service, which is recommendable. Experiences elsewhere also show that it needs time for
the market players to accustom to the new service and appreciate its benefits of and to adjust their operations.

There is sufficient potential demand (freight traffic) on this route, which can become manifest if piggyback tariffs and service levels become attractive.

7.2. Outlook towards other piggyback services in the Northern Dimension area

In terms of potential demand the pilot route in the corridor Moscow-Helsinki is the most promising as Table 16 shows. The table presents trade values and the freight traffic volumes over road between Russia and its neighboring countries in the EU. For all other corridors it is remarkable that the imports to the EU-countries which are carried by road transport are far less than the exports. Meanwhile, the monetary values of imports and exports are well balanced. This discrepancy is because imports to the EU States mainly concerns energy products, which are not carried by road, but are maritime flows or moved by pipeline. This imbalance in demand was confirmed by market players. Its implication for a piggyback service is that the return trip to Moscow will be mainly carrying empty intermodal loading units. This however is not necessarily a disadvantage for competitiveness because also road transport vehicles return empty.

<table>
<thead>
<tr>
<th>2010</th>
<th>Import from Russia</th>
<th>Export to Russia</th>
<th>Import from Russia</th>
<th>Export to Russia</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Value (€ mln)</td>
<td>Value: (€ mln)</td>
<td>Road transport (1000 tons)</td>
<td>Road transport (1000 tons)</td>
</tr>
<tr>
<td>Finland</td>
<td>9117</td>
<td>4716</td>
<td>248</td>
<td>393</td>
</tr>
<tr>
<td>Estonia</td>
<td>752</td>
<td>844</td>
<td>107</td>
<td>318</td>
</tr>
<tr>
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<td>1099</td>
<td>68</td>
<td>472</td>
</tr>
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<tr>
<td>Germany</td>
<td>29900</td>
<td>26270</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>

Table 16. Trade and road transport demand to and from Russia

Source: EU transport in Figures, 2012 (trade values) and ETISPLUS-database (road transport)

The statistics in the table suggest that demand prospects are not as high as the analyses in Concept-1520 suggested.

The Russian Federation now is preparing for three bilateral intergovernmental agreements which should facilitate the border crossing piggyback services scheduled in the first phase of the Concept-1520 implementation:
- Helsinki – Moscow;
- Moscow – Kaliningrad, through Lithuania;
- Moscow – Slavkuv in Poland, through Ukraine.

These international bilateral agreements with all ensuing obligations will only apply to the contracting parties and will not share mechanically to all CU and EU countries. The approach
is comparable to the model applied for the Viking piggyback services. Its weaknesses are the intermediate status and the fact that it provides exceptional conditions to a limited number of market players. Thus, in order to create fair, vital and paying business related to combined transportation it is necessary that strong efforts from the governments continue for creating an appropriate common legal environment.

The most feasible regime for piggyback transportation between EU and CU would be the SMGS railway transport regime because it is more widely adopted than CIM. Pilot routes of piggyback services can start on the basis of bilateral intergovernmental agreements, but on the longer run a common legal environment for piggyback transport between EU and CU is desirable. This requires amendment of the SMGS General Agreement which requires unanimous decision by all participating OSJD-countries and thus will take a long time.

The contacts with railway representatives in Russia’s neighboring countries revealed that none had initiatives of developing piggyback transport services. Lithuania and Belarus have experience with border-crossing transport of maritime containers, but not with continental (non-seaborne) cargo and not in regular services. These countries expressed interest in accommodating the piggyback services if RZD would pursue its development. Terminal infrastructure for that transport however is not yet available and not planned.

The conclusion concerning the poor competitive position of piggyback transport in the piloted route will also be valid for other potential cross-border services. All economic regions in the EU countries with a 1520 mm railway gauge are in the same distance range from Moscow (e.g. 925 km to Riga in Latvia, 980 to Kaunas in Lithuania and 1050 km to Tallinn in Estonia) and production characteristics of the piggyback transport service will also be in the same range as the pilot service, i.e. a 3-day roundtrip. In favor of piggyback transport on the other routes is that road transport to these other countries was reported to be more troublesome than to Finland because of longer border waiting times. This advantage is for as long as these road border issues are not being resolved and meanwhile border procedures for railway transport still need to prove themselves.

The implication of piggyback’s poor competitiveness should not be that combined transport will not deserve any consideration. First, there are alternative forms of combined transport which can produce better results. The positive intention of Concept-1520 was to develop services with lowest possible barriers of use to road transport clients. Piggyback’s disadvantage however are its higher operational costs the fact that horizontal transshipment operations do not easily combine with craned operations for containers. Introduction can be eased if synergy is found with hinterland services of containers and then also existing railway and terminal equipment can be used.

Second, combined transport can become attractive if its development is part of an integrated planning. Companies can reduce their logistic costs if combined transport is well integrated in supply chains. For that, logistic activities like warehousing, cross-docking and distribution centers should be clustered in the vicinity of terminals, preferably on both ends of the combined transport chain. This requires a long-run integrated strategy and planning. This would include early consultation of stakeholders. It may include promoting forms of cooperation between railways and road-based logistics companies.
Meanwhile, also the elements of the Concept-1520 which will actually be implemented can still be of value to international transport operators.

7.3. Legal and policy issues

Despite the poor short-term prospects of piggyback transport, it is recommended that ND-States start or proceed with implementing legislation that encourages combined transport, in particular directed to exempt road vehicles used in combined transport chains from vehicle taxes and road infrastructure charges, from weight restrictions and from night, rush hour or weekend driving bans. This will be a facilitation of Concept-1520 if it (or part of it) finds implementation and else it will increase the likelihood of other combined transport services emerging.

A first necessity for that is that all forms of combined transport are well covered by formal definitions in National Law. Defining of combined transport is important because combined transport will deal with many authorities (amongst whom Customs) and public and private entities in transport operations.

Combined transport is a grey area with respect to liability issues. Ideally the issue would be fully covered by Conventions but history has learned that it is complicated to arrive on an agreement that provides satisfactory coverage of all events and is practical at the same time. Meanwhile international combined transport elsewhere does function properly without such comprehensive multimodal liability regime, because stakeholders there have succeeded to agree on adequate insurances for the entire transport chain. Those who will assume the commercial risk of newly established combined transport services, i.e. the combined transport operator, will also be in the lead of providing contractual solutions for covering the liability issue. This can be through general corporate conditions, as done by UIRR, or by tailored contracts. The efforts to adjust SGMS and the improved harmonization between COTIF-CIM and SGMS will solve current uncertainties for the railway leg of cross-border operations.

A specific issue is customs handling. Because of the high amount of consignments on a single train, individual handling of all customs procedures at the EU-CU borders will consume too much time. Therefore, the combined transport operator should have the possibility to arrange for customs handling at the terminal premises, if not already done by the consignor. The customs regime for all loaded cargoes should be agreed between customs authorities involved before train departure. A customs form that covers the full trains load, even with cargo from multiple owners, should be available for swift handling at the border. This form still needs to be developed and approved. Customs should also recognize trucks and semi-trailers as intermodal loading unit, i.e. as package and not as road vehicle, either if they are loaded or empty.

In the initial phase of border-crossing combined transport services, particularly as long as such combined transport services are novelty, there should be special attention devoted to Customs practice, in order to avoid unnecessary obstruction of services. Market players and Customs officers will need to be instructed how to deal with this new type of transport. An approach as done with the Viking Service between Lithuania and Ukraine in which all
stakeholders together with Customs decide on a protocol will be fruitful and should be endorsed by the National Governments concerned.

7.4. Investment need and funding
The result of the evaluation of the pilot study implies that there is no urgent investment need, because piggyback services are not likely to materialize on short term. Investments in infrastructure and in terminals may be needed on the longer term.

Whether or not and which investments in the railway infrastructure will be needed for combined transport will depend on the features of the service network and on the technology. Piggyback is more demanding for railway loading gauge than conventional transport and it cannot be derived from the Network Statements to what extent such loading gauge is being considered in design of crossing infrastructure like road bridges. Infrastructure Managers should consider the piggyback transport as option on the main corridors, however most probably already do so for higher loading gauges for project cargo.

There is no terminal network for piggyback transport (with side access) and only a modest, not widespread, offer for craned transshipment of containers and therefore developing a service network is likely to involve constructing terminals and upgrading existing ones. Terminal development should be decided on the basis of business cases, but will need coordination for avoiding fragmentation once a demand materializes.

In the future, International Financial Institutes (IFI) can take a role in co-funding of combined transport investments in terminals, infrastructure, rolling stock and handling equipment. Obviously, a funding request will require a solid business case, which cannot yet be demonstrated. NDPTL’s Support Fund can provide co-funding up to 50% for preparing acquisition of funds and loans for investment.

Grants from EU which are typical for this type of activity are from TEN-T and Marco Polo budgets, which both are under revision for the next EU-budget period (2014-2020). With current funding principles only TEN-T budget would be a likely contributor. Implication of its threshold grant value is that it can only be mobilized for large scale terminal investment (more than €5 million), contributing 10%. In the planning phase TEN-T budget can be a useful contributor to studies, for example design studies (up to 50%), however only for mature projects which are close to implementation. Marco Polo budget depends on the amount of cargo that is shifted from road to railways on European Member States territory. For border crossing services between EU and Russia on the 1520mm network threshold values for subsidies will not be met.

7.5. The role of Northern Dimension Partnership on Transport and Logistics.
A network of combined transport services in Northern Dimension would be desirable because it can contribute to objectives of improving transport efficiency and of reducing negative impacts of transport to the environment.

NDPTL should strategically involve in developing a longer term transport and logistics service market. It can, for example, take a role in developing a network of logistics centers for
international transport. Ideally combined transport would become part of such network and therefore locations would be near to potential terminals. Spatial clustering of logistics activities will improve the business case for combined transport, because costs of pre- and end-haulage will drastically reduce.

Developing combined transport requires cooperation between stakeholders from the road and rail transport sectors and possibly from the maritime industry as well. These stakeholders are no natural allies. NDPTL can facilitate a dialogue for improving the border-crossing logistics including of combined transport.

NDPTL can also contribute to improving the knowledge base for this purpose. Information on international (and domestic) freight traffic is not well developed. For example, data on freight transport flows, information about the available infrastructure and logistics services and about development plans are important for balanced decisions for a logistics strategy, but poorly available.
Annex I  Map of the terminals in the Concept-1520 network
ANNEX II Concept-1520 Piggyback service network
ANNEX III Terminal layouts as presented in the Concept-1520

[Diagram of terminal layouts]