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RETRACK

REorganization of Transport networks by advanced RAil freight Concepts

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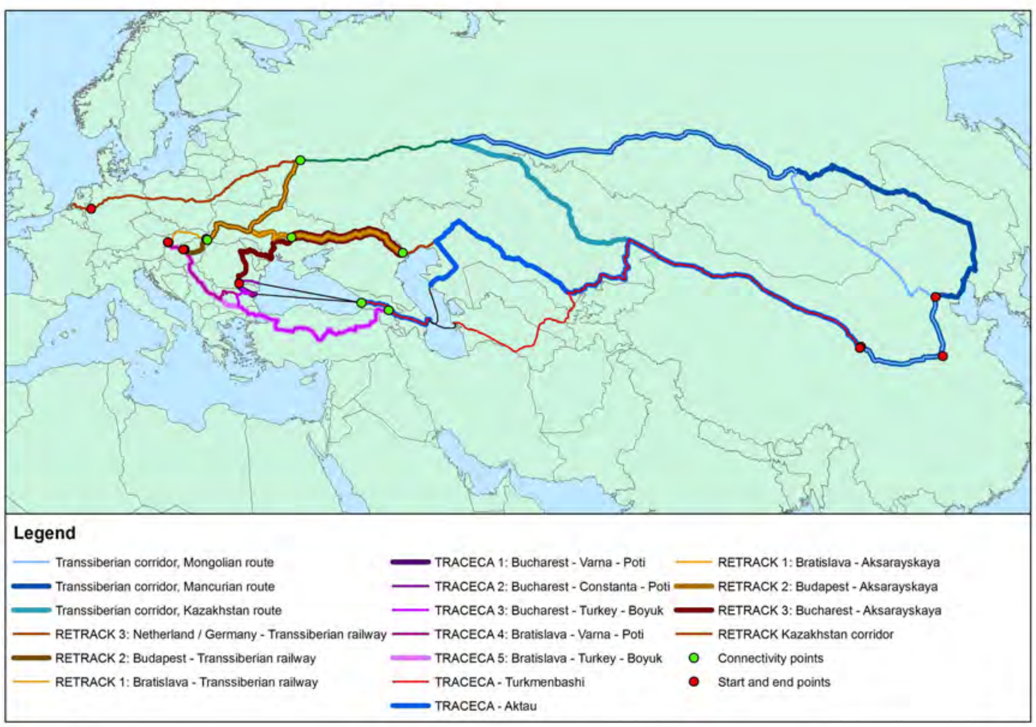
1 Introduction

1.1 Background information

The main objective of the RETRACK project is to connect the North Sea with the Black Sea by means of a frequent and reliable train service. The development of the RETRACK corridor should be put in a broader continental perspective, while taking the worldwide economic and trade development trends into consideration. Therefore, the WP 13 is focused on the potential of the RETRACK corridor prolongation to China. Theoretically, multiple options are available through three main railway corridors: the Trans-Siberian corridor, the Central – Kazakhstan corridor and the TRACECA rail corridor. Each of these corridors can be further detailed through several concrete rail routes, each of which has particular strengths and weaknesses. The following map provides an overview of the studied routes.

Map 1: Connection of Europe and China through the rail bridges



1.2 Objective of Task 13.1

The WP 13 Task 1 summarised the current freight strategies and policies of the countries which participate in the three above mentioned corridors. The main objective of WP 13 Task 2 is to make an assessment of the current condition of each alternative corridor and to determine the main opportunities and bottlenecks they present. A comparison of these three routes will be made in order to see which of them is the most attractive for the RETRACK service.

The main objective of WP 13 Task 2 is to determine the main opportunities and bottlenecks for the prolongation of the RETRACK rail corridor to China through the three alternative corridors, 1) Trans-Siberian, 2) Central - Kazakhstan and 3) TRACECA. Research has shown that block trains between Europea and Asia are currently functioning more as a company initiative, as there is no sufficient demand for the development of a regular block train at this origin – destination. Therefore, 13.2 will focus on the perspectives of the development of container trains between Europe – China and will show if there is a existing perspective for the block train development.

The economic forecast, as well as the results of the interviews conducted within Deliverable 13.1 have illustrated that Western Chinese provinces are becoming more interesting from an economic perspective. Therefore, the deliverable 13.2 focuses on connecting RETRACK to the Western Chinese provinces. In this respect, Lanzhou has been chosen as the market connecting point in China – being a central town in the Western Provinces of China and also a key hub for destinations further into China.

1.3 Outline of the report

The WP13.2 report contains the following chapters:

- Chapter 2 provides an overview of recent studies on the railway corridor EurAsia, but also on recently launched railway services between Europe, Russia, Kazachstan and China;
- Chapter 3 describes the selected routes, as shown above, from a technical perspective;
- Chapter 4 creates a general picture of the railway transport organisation in the EurAsia region;
- Chapter 5, 6 and 7 povide a detailed description of the three selected corridors: TransSib, Central and Traceca. The infrastructure, rolling stock condition, strengths, weaknesses and the main bottlenecks on the corridors are described. The information on the last two topics comes mainly from interviews held with the stakeholders in the different countries;
- In Chapter 8 a forecast is made of the potential future freight flows;
- Chapter 9 illustrates a comparison made between the different routes;
- Chapter 10 draws conclusions on the perspectives of the RETRACK prolongation to China through the selected routes.

2 Results of recent rail/intermodal transport R&D projects and pilot train runs between Europe and China

As Europe, Russia, China and India are the main economic powers responsible for major goods exchanges within the Eurasian Continent, their desire is to have the most direct trade routes with one another. Consequently, almost all (99%)[1] goods between the EU and the Asian Pacific region are shipped by sea. Land corridors through Central Asia are rarely used. In order to change this picture and reanimate the land corridors, several initiatives and projects have been undertaken in the last years. This chapter summarises projects and contributions which are most relevant for the development of corridors proposed in the present study, including international and regional initiatives, monitoring indices and block train operations.

2.1 The recent rail transport projects and train pilots

The CAREC, TRACECA and NELTI initiatives and the dedicated initiatives within UNECE, created a framework of strategies for technical and financial coordination and development of land corridors, transport infrastructure and trade. All these initiatives acknowledge the importance that transport and trade play in the promotion of economic growth, and socio-environmental development. However, there are differences in the approaches related to the regions and transport modes they cover (Annex 1 gives an overview). The NELTI initiative concentrates on road developments, while CAREC, TRACECA and UNECE's initiatives cover both rail and road transport. CAREC and TRACECA also include the transport of passengers, whereas NELTI encompass only the deliveries of goods.

As proper measurement of transport performance is a major concern and a set of indicators and tools have been developed to monitor the implementation of transport strategies and compare the performance of corridors. Although the World Bank's LPI, TRACECA's TRAX, and CAREC's performance monitoring indicators are all based on transport data, they still differ substantially. The World Bank's LPI indices are country-based and include all types of transport modes (air, maritime, rail and road), which allows comparisons worldwide, whereas CAREC measures transport performance along road and rail corridors of its own network and TRACECA's TRAX monitors road corridors of its own network and compares them to an alternative (competitor) route. Furthermore, CAREC measures quantitative variables such as time and cost. The World Bank's LPI and TRACECA's TRAX produce both quantitative and qualitative indicators based on interviews, which are, thus, subjective.

This chapter also focuses on the operation of block trains between Europe and Eastern Asia that have multiplied within the last years.

Finally, the chapter includes results from a study of an integrated logistics system and a marketing action plan for container transportation in Kazakhstan. This is of high relevance to this study, particularly for the Central corridor assessment.

[1] EUCAM Working Paper "Optimisation of Central Asian and Eurasian Trans-Continental Land Transport Corridors", December 2009

2.2 International and regional corridor initiatives

2.2.1 CAREC rail corridors

The Central Asia Regional Economic Cooperation (CAREC) Programme is a partnership between Afghanistan, Azerbaijan, the People's Republic of China, Kazakhstan, the Kyrgyz Republic, Mongolia, Pakistan, Tajikistan, Turkmenistan, and Uzbekistan, and 6 multilateral institutions - the Asian Development Bank (ADB), European Bank for Reconstruction and Development (EBRD), International Monetary Fund (IMF), Islamic Development Bank (IsDB), United Nations Development Programme (UNDP), and the World Bank. It was launched in 1997 to promote the development of its members through regional cooperation in transport, trade facilitation, trade policy, and energy. Within the transport and trade facilitation areas, the main goals are (i) to establish competitive transport corridors across the CAREC region; (ii) to facilitate goods movement through corridors and across borders; (iii) to develop a sustainable, safe, and user-friendly transport and trade network; (iv) to integrate customs reform and modernisation; (v) to integrate trade facilitation approaches through interagency cooperation and public-private partnerships; and (vi) to develop efficient regional logistics.

CAREC corridors are selected according to the major transit trade directions and the main external markets. Important selection criteria comprise the consistency with the EURASEC and UNESCAP networks and prospects for promotion of growth, connectivity and sustainable development. The corridors have to pass through at least two CAREC countries, include both rail and road segments for long and short distance traffic, and be transit corridors with origins and destinations outside the CAREC region. Figure 1 shows all CAREC corridors which mainly run in two directions – north-south and east-west. A more detailed description of the 6 corridors can be found at www.carecprogram.org and in ADB's "Central Asia Regional Economic Cooperation Transport Sector Strategy Study" (December 2008).

Figure 1: CAREC Corridors

Source: http://www.carecprogramm.org/

The same study gives a description of the transport sector in the CAREC Region. Further details regarding the current traffic flows and forecast can be found in the study:

- The road and rail networks comprise 271,000 km and 25,700 km, respectively. Kazakhstan accounts for 30% of the road and 55% of the rail network, holding the largest proportion, followed by the Xinjiang Uygur Autonomous Region (XUAR) that accounts for 22% of the road and 11% of the rail networks, and Uzbekistan (16% and 15%, respectively).
- Road transportation is the dominant mode for freight within the region (70% - 90%). However, rail is the dominant mode with a share of 80% for export, import and transit, i.e. in long distance movements. Road and rail transit traffic represents 28% of the international traffic, which is largely concentrated in Azerbaijan, Kazakhstan and Uzbekistan.
- Oil and oil products represent 30% of the total freight movements and are the most common commodities moved by rail along with minerals and metals (coal, copper), construction materials (mostly cement), cotton and general goods in containerised and non-containerised form.
- Generally, there is a low traffic flow by road at border crossings (35 - 610 vehicles per day). Crossings located in the proximity of major cities show higher traffic. Traffic travelling with ferries on the Caspian Sea has remained very low. Ferries mainly carry rail traffic and occasionally trucks.
- Corridor 1b rail and road offers good prospects for Europe–Eastern Asia transit. The new Zhetygen–Khorgos–Jinghe rail line when constructed, will cut the distance from Urumqi to Almaty by 421 km. But still, Ala Shankou is currently the main rail gateway between Central Asia and the PRC. Parallel to both rail corridors runs the Asian Highways complementing but also competing with them.
- Rail border crossing traffic between Georgia and Azerbaijan is high (17 million tonnes in 2006), but the traffic consists mainly of the export and transit of oil, cotton and grain products.
- Kazakhstan is currently building a rail line between Shalkar and Beyneu, which will save more than 1,000 km and reduce time spent at multiple border crossings from the Mediterranean to the PRC.
- Rail traffic along corridor 3a is high and the highest between Shu and Lugovaya (18.5 million tonnes in 2006).
- Along CAREC 4b the road completion to Zamyn Uud is only expected to shift transport of passengers from rail but not for freight, being that rail freight is expected to increase to 36 million tonnes (from 15 in 2006) by 2015.

The “Implementation Action Plan for the CAREC Transport and Trade Facilitation Strategy” published in November 2008, aims to upgrade the six corridors to an international standard by 2017 and (i) increase transit trade volumes between Europe and Eastern Asia via the CAREC corridors from 1% in 2005 to 5% by 2017; (ii) increase intra-regional trade volume by 50% by 2017 (from 32 million tonnes in 2005); and (iii) reduce border crossing time along the CAREC corridors by 50% by 2012, and a further 30% by 2017, when compared to 2007.

In order to achieve these goals, several projects[2] have either been completed or are currently ongoing. They include both physical and non-physical measures. They are mainly focused on road transport, however, there are also some ongoing rail/multimodal transport projects:

- Installation of signalling and telecommunication facilities as well as procurement of equipment for maintenance and other facilities for asset management between Bereket and Buzhun (311 km) in Turkmenistan;
- Re-powering and improvement of diesel–electric locomotives in Uzbekistan;
- Capacity-building of the Ministry of Railway Transportation of Turkmenistan; and
- Development of a multimodal logistics centre at Zamyn-Uud in Mongolia with customs and quarantine facilities for road-to-road, road-to-rail, and rail-to-rail transhipment as well as the procurement and installation of terminal equipment and management systems to support efficient operations.

The following projects on road transport infrastructure have also been completed and reported. They may have a competitive advantage regarding the corridors proposed in this study:

- The Third Xinjiang Highway project increased the average speed along the Kuitun-Salimuhu highway[3] thanks to the modernisation of trucks with a major loading capacity, the pavement of regional roads and the removal of toll collection on roads in the classes II and smaller, which diverted traffic from the highway. The project also improved the road quality network and reduced the rate of traffic accidents involving fatalities.
- The Highway project in Azerbaijan included improvement of the the Ganja-Shemkir and Shemkir-Gazakh road sections, which reduced travel times by 33% (from 60 to 40 minutes) on the M2 Shamkir-Gazakh.

In regards to Trade Facilitation, the following achievements must be mentioned: Azerbaijan's implementation of the National Single Window (NSW) in 2009 and its expansion to further border regulatory agencies; the use of GPS transponders to vehicles entering Azerbaijan, which are returned when departing the country, to improve the monitoring of the movement of cargo under customs supervision (electronic seal and safe packets were also used at other customs controls within the CAREC region); and the implementation of a Joint-Customs-Control (JCC) pilot-project at Dostyk (KAZ) – Alashankou (PRC) and Zamyn Uud (MON)-Erenhot (PRC). No results are available for these BCPs, but similar projects at other BCPs in the PRC reported that the adoption of unified cargo manifests and the development of simplified border documentation requirements led to simplified procedures and a reduction in processing time by 35%. In addition, two customs modernisation projects are currently ongoing in Mongolia and Kazakhstan. In Mongolia, an updated automated data processing system and seamless exchange of customs-related information; improved customs border facilities involving equipment and enhanced analytical capabilities of customs laboratories; and strengthened customs institutions are the expected outcomes. A parallel grant to strengthen the institutional and human capacity of the Mongolian Customs General Administration is also expected to simplify and improve business processes; upgrade information and communication technology skills of customs officers and personnel; improve

[2] CAREC's website (www.carecprogram.org) offers an overview of the completed and ongoing projects within transport and trade facilitation. In total, 23 projects have been completed and 51 are still ongoing in the Transport sector, whereas under the Trade Facilitation area, 9 projects are still ongoing and 6 have already been completed

[3] Kuitun-Wusu (K-W) from 47 to 120 kph, Wusu – Bole Fork (W-BF) from 45 to 80 kph, and Bole Fork-Sailimuhu (BF-S) from 30 to 60 kph

coordination with related agencies; enhance partnership with the private sector; and deepen cooperation with customs officials of neighbouring countries. In Kazakhstan the project will expectedly lead to a better performing Customs Control Committee; comprehensive and improved customs operations; an incorporated information and communication technology in CCC operations; and a strengthened project coordination, implementation and management.

CAREC generally supports its members to adapt national customs regulations and procedures that are up to the international standards and best practices, such as those compiled in the World Customs Organisation's (WCO) "Customs in the 21st Century". Furthermore, the ADB is designing an investment project to (i) improve infrastructure of selected BCPs; and (ii) support the development of NSW and development of a regional platform for networking of CAREC NSWs. Capacity building has also been a regular component of CAREC efforts. However, CAREC understands that there is a need for further improvements, such as the extension of Risk Management and Post-Entry Audit measures to other border control agencies (sanitary and phyto-sanitary); expansion of the JCC programme to other BCPs; a wider application of TIR carnets for inter- and intra-regional transit by improving hardware and software required at BCPs; development of regional transit arrangements for certain segments of the CAREC corridors; development of a Time–Release Study (TRS) to complement the Time-Cost-Distance methodology of the Corridor Performance Measuring Monitoring programme; and the performance of a more effective customs capacity building.

2.2.2 NELTI

The New Eurasian Land Transport Initiative (NELTI) was launched in 2008 in Tashkent under the organisation of the International Road Transport Union (IRU) and with the support of major international organisations and national Governments. Within NELTI commercial deliveries of industrial and consumer goods across Eurasia, performed by independent road transport companies from Eurasian countries are monitored. NELTI responds to IRU's goals of interconnecting businesses in Asia and Europe by means of reopening the ancient Silk Road and by increasing public and business awareness of the opportunities of this land bridge.

Since its establishment in 2008, the NELTI has completed 2 phases and is currently in its 3rd phase. NELTI I identified three main road haulage routes (Northern, Central and Southern); revealed the "problematic points" along each Eurasian road route; proved the commercial viability of road haulage between Europe and Asia[4] and showed that the existing road infrastructure is sufficient enough to undertake regular road shipments.

NELTI I pointed out that further development around large cities (diversionary routes and ring roads) and the improvement of the logistical and ancillary infrastructure (parking areas, service stations etc.) are necessary to cope with an increased freight volume. During NELTI II[5] the routes were extended with the Chinese route and the Afghan route. The ongoing phase NELTI III is continuing with the former efforts to develop road transport in the region through the regular monitoring of trucks (ECO RMT/NELTI 3), IRU's Model Highway Initiative and the project "Afghan Transit".

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[4] Shipments under the IRU's NELTI Project were undertaken consistently and run on an entirely commercial basis. Hauliers were not given any preferential treatment in the form of "green channels" or any other type of support

[5] NELTI II was carried out in close collaboration by the IRU and the Asian Development Bank (ADB), and its CAREC program

Among the most important events within the framework of the IRU NELTI Phase II were[6]: the introduction in 2010 of the multilateral permit system within the framework of the Black Sea Economic Cooperation (BSEC) to enhance the efficiency of international road transport haulage and streamline border crossing procedures along the NELTI Central and Southern routes; the activation of the Shanghai Cooperation Organisation (SCO) multilateral agreement to develop multilateral haulage to and from China; and the implementation and signing of Memoranda of Understanding (MoU) between the IRU and governments within the Euro-Asian region and international and regional economic organisations[7] as a legal framework to promote cooperation. These actions have improved the competitiveness of the road transport in the region.

Figure 2: NELTI's Routes

Source: NELTI II Final Report Road Map, NEA

Monitoring of driver trips within the NELTI project has allowed the identification of obstacles in international road haulage such as the existence of bilateral agreements and permits that prevent from free selection of routes and transit; different requirements and procedures regarding customs regulations; long driving times and high charges, discriminatory and non-synchronised procedures regarding VISA appliance; high border crossing expenditures (on average 25% of the freight costs but sometimes even 40%); border crossing delays (on average longer than 3-4 hours and sometimes double, if related to exit procedures); lack of synchronisation of transport checks and safety procedures; lack of modern logistical terminals, particularly at the borders with China, where trans-loading goods from Chinese trucks to trucks registered in other countries is required; insufficient ancillary infrastructure; poor information, long waiting times and high costs regarding ferry departures (Caspian and Black Sea); and extortions by border related agencies. Some of them, especially those regarding regulations and border-crossing related procedures, including poor equipment of customs posts, are also among the constraints on rail transportation.

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6 IRU's NELTI 2 – Final Report Road Map, NEA.

7 Since its implementation in November 2008, MoUs have been signed with 11 states, which chronologically are: the Republic of Uzbekistan, Kyrgyz Republic, the Republic of Kazakhstan, the Republic of Tajikistan, Azerbaijan Republic, Ukraine, Georgia, the Republic of Moldova, the Islamic Republic of Afghanistan, the Republic of Armenia and Belarus.

The results on the Northern and Central routes and their connections to China are of special interest for RETRACK routes. These routes can compete and complement the RETRACK TransSib, TRACECA and Central Kazkahstan corridors.

The types of cargo that are transported along the NELTI routes are as follows:

- Northern route: textiles, agricultural, industrial equipment, food and pharmaceuticals;
- Central route: automotive components and cotton;
- Southern Route: capers and walnuts, leather, raw materials, dried fruit, consumer goods, spare parts for cars and plastics for window frames.

According to the monitoring results[8], the average speed along all NELTI routes is 18.4 km/h, including the time spent at borders and resting time. Comparison of this indicator with SWD on previously identified CAREC rail routes (compliant with RETRACK routes) shows that transport on NELTI road routes is generally slower than along the rail corridors 1a (18.9 kph), 1b (20.7 kph) and 6b (25.5 kph), but quicker than on CAREC corridors 2b (9.0 kph), 3a (17.8 kph), 4 (6.8 kph) and 6a (10.0 kph). Costs at border crossings were highest at the Kazahkstan-Russian Federation border crossing. Unofficial payments represent 32.6% of official paid duties but can in some cases make up 95% of the official payments at border crossings. In relation to the overall expenditures (excluding fuel and rest expenses) they are highest along the Afghan (39.0%), Southern (34.6%) and Northern (32.4%) routes and lowest along the Central route (10.6%). The most frequent reasons for extortions are completion of procedures at borders and biased search for drugs and unfounded inspections. Delays at border crossings were longest at the border crossings of Kyrgyzstan-Uzbekistan, Kazahkstan–Russian Federation and Kazahkstan-Uzbekistan along the Northern Corridor, and at Turkmenistan-Azerbaijan border crossing along the Central Corridor.

To sum it up, IRU's NELTI road network has proved the capacity of connecting Europe and Asia through land corridors. However, institutional, procedural and infrastructural problems along NELTI routes prevent transit road transport from developing more rapidly in the region and adapting to growing freight volumes. Discriminatory and abusive practices regarding route selection, transit permits and border controls represent some of the main problems. They often rely on institutional problems such as the existence of bilateral agreements. Delays are often caused by time-consuming procedures regarding issuance and application of VISA, customs and safety controls, ferry crossings and no existing coordination of border agencies.

2.2.3 TRACECA

The Transport Corridor Europe Caucasus Asia (TRACECA) is a program aimed at strengthening the economic relations, trade and transport communication in the regions of the Black Sea basin, South Caucasus and Central Asia responding to common aspirations of its Member-States. The European Union technical assistance program TRACECA was first launched in May 1993 and the "Basic Multilateral Agreement on International Transport for Development of the Europe-Caucasus-Asia Corridor" (MLA) was signed in 1998 by Azerbaijan, Armenia, Bulgaria, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Romania, Tajikistan, Turkey, Ukraine and Uzbekistan.

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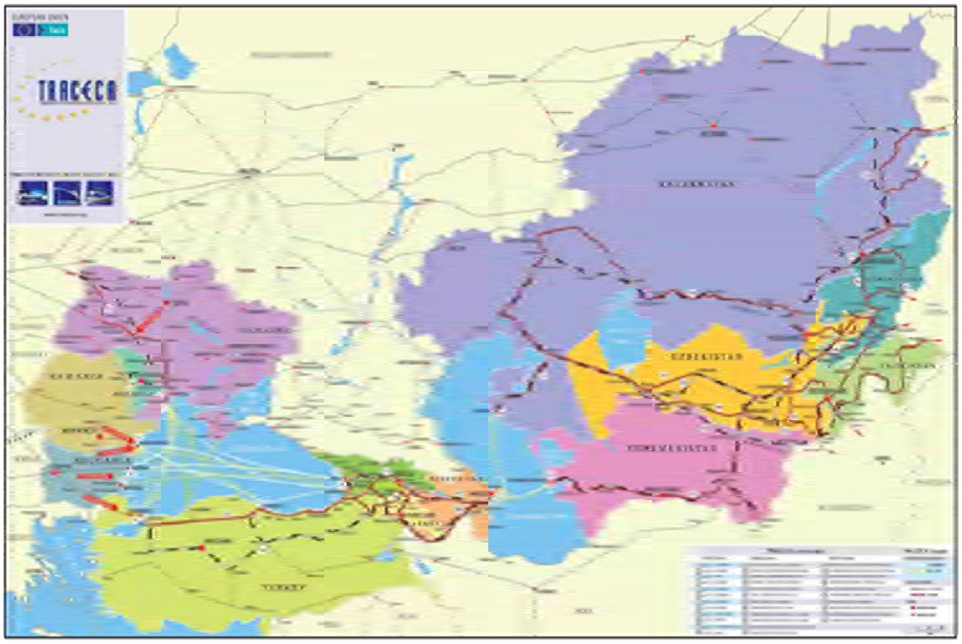
[8] Data is collected en route by NELTI drivers in logbooks and UNESCAP time/cost-distance methodology is applied.

Figure 3 shows the TRACECA rail and road networks, which include 22 routes and 12 ports. Of all the routes, 4 are on rail, 6 on road and 12 on rail and road. Further information about the history, structure and goals of TRACECA, as well as maps on routes can be found at www.traceca-org.org.

Figure 3: TRACECA rail and road network



Source: Study on Developing Euro-Asian Transport Linkages, UNECE UNESCAP, 2008.

According to TRACECA's Transport and Trade Atlas (2009), the main commodities within TRACECA are petroleum products, followed by crude and manufactured minerals and building materials, and metal products. At international level the main commodities are crude oil, ores and metal waste, and solid mineral fuels. For the traffic forecast up to 2030 it is expected that the situation will remain similar to that of regional trade, and that the trade with machinery, transport equipment and manufactured articles will increase the most (490%). In regards to international freight ores and metal waste will take the leading position experiencing the highest growth (210%). The same study shows that in 2007 rail freight transport represented 13% of the total domestic trade and 21% of the international trade, whereas in terms of bln/tonne/km the share of rail freight transport was 24%. The Ukraine showed the highest share of rail freight transport at both domestic (50%) and international (54%) levels. Container transport on rail was the highest in Kazakhstan with 473 thousand TEU, followed by Ukraine with 327 thousand TEU.

Maritime freight transport represents 6% in the total domestic trade and 25% in the international trade[9]. Varna, Constanta and Poti have almost reached their full container capacity and in particular Varna where a turnover of 99 thousand TEUs was registered, with the port capacity being 100 TEU. At Constanta and Poti there were 1411 out of 1500 and 184 out of 200, respectively[10]. In the case of Aktau the main findings of a recent feasibility-study have shown that the port has also reached its maximum capacity, despite its extension and

[9] TRACECA Transport and Trade Atlas, NEA, November 2009

[10] Data regarding port cargo handling at Constanta and Poti commodities in imports, exports and transit by rail for Uzbekistan and Turkmenistan was extracted from data excel files on www.traceca-org.org

expansion of the oil pipeline and that it will only be capable of handling increased volumes of cargo if further upgrades and constructions are carried out. Agreements ensuring oil volumes are, however, a requisite to ensure that new facilities are not in vain. In addition, the construction of a new grain terminal by 2014 and two new dry cargo berths by 2017 is recommended, but an alternative use of port extension should be found until the new cargo berths are needed[11].

The main identified problems within the TRACECA region are the fragmentation of transport systems within and between transport modes due to technical and legal barriers; an obsolete infrastructure; an overloaded network; poor technology and insufficient organisation at nodes and interchange points; lack of an integrated customs information system (ICIS); and low levels of safety and security.

On-going and finalised TRACECA projects aim at overcoming these barriers. Several technical assistance[12] and priority projects[13] focus on rail, ferry and intermodal transport. Among them, the project "Motorways of the Sea II", aims at the development of the logistics infrastructure and multimodal transport by removing the existing logistical bottlenecks and ensuring better interoperable connections focusing on flows between ports and hinterland and ports on both seas. It also includes the establishment of container train logistic centres and further targets sector reforms for port, maritime and logistics operations, as well as the introduction of port environmental management systems.

IDEA's (Transport dialogue and interoperability between the EU and its neighbouring countries and Central Asian countries) goal is the delivery of a sustainable, efficient and integrated multimodal transport system through provision to Governments of assistance in the selection of the appropriate transport infrastructure projects. To achieve this, the project encourages further regional cooperation; attracts the support of International Financial Institutions and private investors; and links the TRACECA region with the Trans-European Transport network. This includes technical assistance for the implementation of the Strategy, the development of regional transport and infrastructure investment plans, as well as the selection of priority projects. For railways those priority projects include the rehabilitation of the Armenian railway infrastructure, the Varna-Ruse rail rehabilitation in Bulgaria, the Aktogai-Dostyk railway electrification in Kazahkstan, the Baku-Alat-Beguk-Kesir railway rehabilitation, the Poti-Baku-Container Block train, the Vakhdat-Dzirgatal-Kyrgyzstan railway, the intermodal logistic centre of the new international sea trade port at Alyat in Azerbaijan (70 km south from Baku) and the Varna ferryboat and the Yerevan logistic centre. The Mak-Karabuk-Zonguldak railway electrification and signalisation in Turkey, the Ruse region intermodal terminal in Bulgaria and the new multimodal container terminal in Illichivsk in Ukraine are also planned. Information on completed, ongoing and planned projects can be found at www.traceca-org.org.

TRACECA's recommendations regarding rail and ferry transportation, customs and border procedures and logistic development include the traffic forecast and establishment of future major traffic corridors and axes; further identification of key transport projects; improvement of non-physical barriers such as the quota of permits on transit transport, transit fees, restrictions on maximum weights, VISA and customs procedures; implementation of the

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[11] Aktau Port Development, Masterplanning & Feasibility Study.

[12] Technical Assistance (TA) projects are financed by the European Union, TACIS programs or other donors, and they focus on institutional or management issues.

[13] Priority projects are selected among those presented by member countries within the framework of investment forums. Evaluation is made by neighbouring countries and representatives of other two regions with support of the IDEA Team and under the observation of TRACECA Permanent Secretary, following a set of criteria which includes technical, economic, environmental and policy issues as well as the prospect of regional integration.

international Single Administrative Document (SAD); automation of customs procedures and documentation; development of post release audit techniques and promotion of risk analysis management; facilitation of infrastructure at border points; submission to joint conventions regarding border crossing and transit procedures; promotion of containers in maritime shipping to reduce the transport costs and reduce damage and theft; proportion of infrastructure promoting the use of hub ports; investments in logistics platforms, both at the ports and in the hinterlands; and implementation of a harmonised legal and regulatory framework regarding the liability of multimodal carriers. In addition, further reforms to enhance the efficiency and financial viability of the railway systems include the reduction of government control and intervention, open and non-discriminatory access to the infrastructure to increase competition and thus, improve service and reduce prices; and the promotion of the interoperability in the railway system at both organisational (streamlining border-crossing procedures) and physical/technical levels (track gauges, rolling stock, power supply on electrified sections, telecommunication and data exchange systems, control-command and signalling systems).

2.2.4 UNECE initiatives

The United Nations Economic Commission for Europe (UNECE) is a multilateral platform which facilitates greater economic integration and cooperation among its member countries and promotes sustainable development and economic prosperity. 56 countries from the European Union, non-EU Western and Eastern Europe, South-East Europe and Commonwealth of Independent States (CIS) and North America dialogue and cooperate on economic and sector issues, and over 70 international professional and other non-governmental organisations take part in UNECE activities. UNECE has largely contributed to developing transport and trade facilitation between Europe and Asia. Its main initiatives include the Euro-Asian Transport Links (EATL) project and the United Nations Special Program for the Economies of Central Asia (SPECA) – and the related Aid for Trade (AfT) initiative. Through these and other programs such as the United Nations Development Account (UNDA), UNECE has been involved in relevant issues such as the development of international transport networks (TER, TEM) the implementation of the TIR Convention[14], the promotion of the hinterland connection of seaports, the harmonisation of transport regulations, the implementation of the Almaty Programme of Action (APA)[15], the facilitation of member-countries' participation in the work of the Inland Transport Committee (ITC) and the development of the freight village concept by means of providing countries and stakeholders with technical assistance and capacity building as well as intergovernmental forums. In Central Asia activities are jointly promoted with The United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP).

The Developing Euro-Asian transport links (EATL) project focuses on the movement of goods between countries - especially on those goods that are transported in standardised twenty and forty foot containers - and aims to (i) examine the current status of Europe-Asian transport connections; (ii) evaluate land-based transport routes that may be viable alternatives to traditional maritime routes; and (iii) suggest ways by which those potential routes might be improved to help countries along them to develop themselves. A special focus is put on landlocked countries because they are dependable on each other to facilitate the land bridge, which opens them to international markets. EATL is currently in its 2nd Phase and a draft already exists for its implementation in the 3rd Phase. The last available results

14 Efforts to introduce the electronic TIR are currently carried out. The eTIR XML Schema is available at UNECES's website.

15 The program's main aim is helping landlocked countries become land-linking countries.

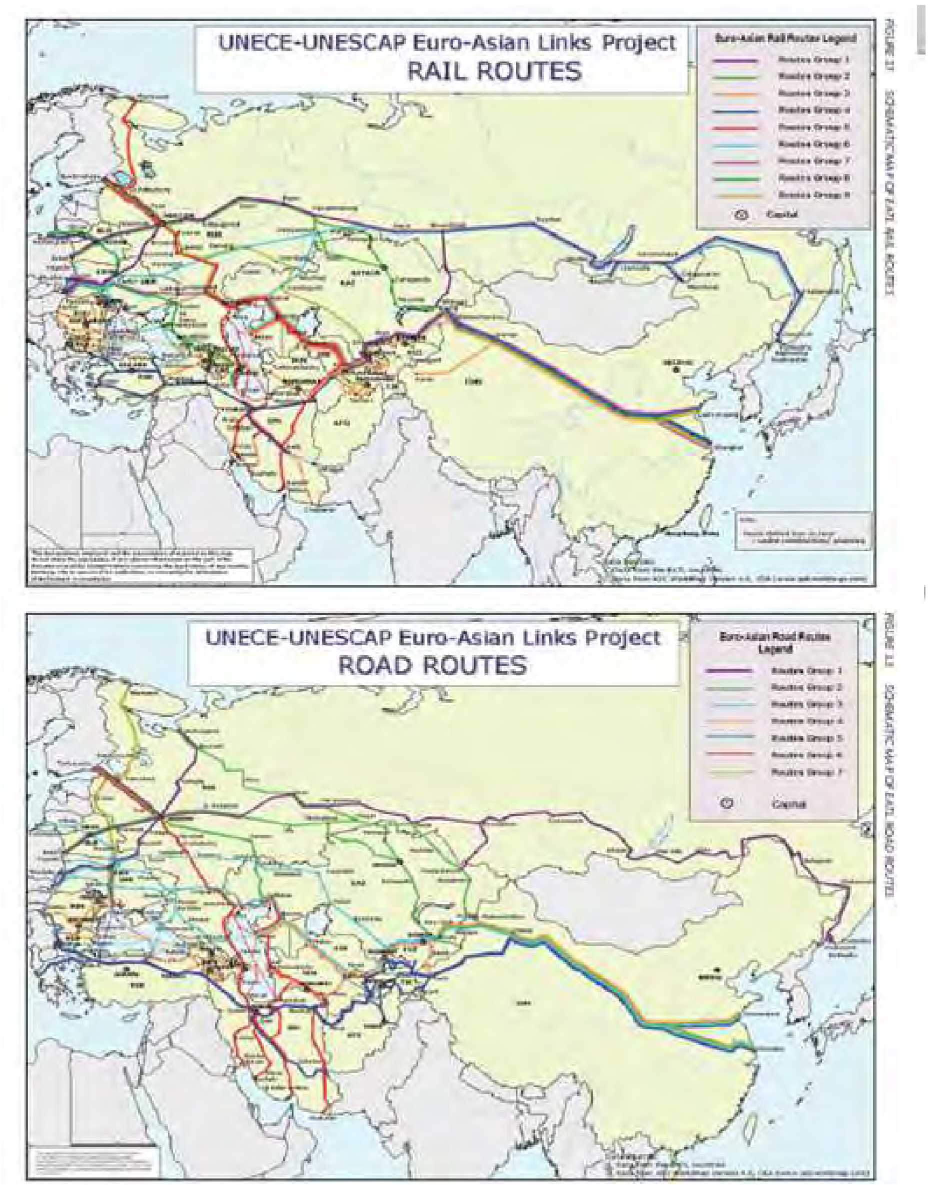
refer, however, to its 1st phase, carried out between 2002 and 2007, and are compiled in UNECE's and UNESCAP's joint study on developing Euro-Asia transport linkages (2008).

These can be summarised as follows:

1. Identification of major rail, road and inland water routes connecting Europe and Asia to be considered for priority development. In total 9 EATL rail routes, 7 EATL road routes and 16 EATL inland waterway routes. Figure 4 shows the rail and road routes. A more detailed description on these routes is given in the study.
2. Identification of a number of key container depots, intermodal terminals and ports (48 EATL inland ports) along the selected routes.
3. The prioritisation of 230 investment projects to develop transport infrastructure in 15 countries based on (a) availability of funding, (b) functionality/coherence and socio-economic efficiency and sustainability criteria, and (c) the project's total score. Transport projects on railway accounted for 54% of the investment cost, on road for 29%, on maritime for 13% and on inland water for 4%.
4. Identification of physical and non-physical obstacles along the EATL routes. In regards to railway transport the main constraints are: inadequate or incompatible transport infrastructures, bottlenecks, missing links, lack of computerisation, insufficient advance notifications, co-existence of various non-standardised EDI-systems, co-existence of a different legal basis (CIM/SMGS), poor financial conditions and lack of resources to build up new infrastructure/missing links and absence/week enforcement of inter-railway agreements.
5. The provision of participating countries with UNESCAP Time/Cost Methodology to analyse the routes and allow identification of physical obstacles at border crossings by comparing results on time and cost. The study presents in detail two cases on road transport: Tashkent-Istanbul and Bishkek-Novosibirsk.
6. Creation of a comprehensive Geographic Information System (GIS) database: in total 45 GIS maps covering the rail, road and inland water routes
7. Creation of a temporary coordinating mechanism in the form of the Group of Experts appointed by participating Governments.

From the rail EATL routes, EATL 1 matches the RETRACK Trans Siberian (Mancurian) corridor, EATL 2 with RETRACK Trans Siberian (Trans Asia/Kazakhstan) from Moscow, EATL 3 with RETRACK TRACECA Turkmenbashi, and EATL 7 with RETRACK Trans Kazakhstan from Shykment. In addition, some other EATL routes are partly comprised in RETRACK Corridors: EATL 3 in RETRACK Traceca Aktau (for the common part with Turkmenbashi), EATL 4 in European segments of RETRACK TRACECA, EATL 5 (Aktau-Makat) in RETRACK TRACECA Aktau, and EATL 5 (Volvograd-Makat), EATL 8 (Chop-Rostov) and EATL 9 (Rostov-Makat) in RETRACK Trans-Kazakhstan.

Figure 4: Euro Asian Links Project (Phase I): Rail and Road Routes



Source: Joint Study on Developing Euro-Asian Transport Linkage, UNECE-UNESCAP, 2008

The study gives recommendations within the areas of infrastructure development, trade facilitation and policy for the participating countries. These are: expedite the implementation of identified priority projects with secured funding; concentrate efforts on incorporating all the identified EATL routes and increasing its functionality and coherence with the existing networks rather than expanding networks; and secure provision of realistic information on the actual level of the investment expenditure needed to modernise the EATL network. Regarding trade facilitation it is recommended to address non-physical obstacles such as excessive documentation requirements, delays at border crossings, unofficial payments, and unexpected closures of borders in an integrated manner by all the authorities concerned and in consultation with the private sector; to focus on capacity building and particularly that of officials dealing with border crossing procedures; use UNESCAP time/cost-distance methodology to further identify and isolate bottlenecks and assess the success of facilitation measures and the competitiveness of the identified routes with periodic snapshots; and increase efforts to promote, accede and implement the international legal instruments on transport and border crossing facilitation.

A comparison study of Euro-Asian maritime routes with selected rail routes (EATL Phase II) is currently under preparation.

In addition, EATL, UNECE and UNESCAP jointly provide overall support to the activities of the SPECA programme, which was launched in 1998 upon the Tashkent Declaration to strengthen sub regional cooperation in Central Asia and its integration into the world economy by creating incentives for economic development with the support of donor countries and international organisations. This programme brings together Afghanistan, Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. The SPECA's Project working group (PWG) on Transport and Border Crossing (TBC) focuses on the development of Euro-Asian transport linkages, including the possible extension of the TER (railway) and TEM (road) networks into the region.

UNESCAP also carries out important work through its ALTID (Asian Land Transport Infrastructure Development) programme in developing the Asian Highway, the Trans-Asian Railway and other initiatives to improve transport linkages within Asia as well as between Asia and its main trading partners in Europe. The Trans-Asian Railway (TAR) was initiated in the 1960s to originally connect Singapore and Istanbul for the purpose of reducing transit times and promoting trade expansion, economic growth and cultural exchanges. In 2003 and 2004 four demonstration runs of container block-trains along the Trans-Asian Railway Northern Corridor were successfully implemented. As a consequence of UNESCAP efforts, the Intergovernmental Agreement on the Trans-Asian Railway Network entered into force in June 2009. This agreement lays the framework for the coordinated development of rail routes of international importance and their efficient operationalisation. Up-to-date TAR routes cover nearly 114,000 km in 28 countries. Of special interest for RETRACK purposes are the Central Asian and Caucasus network covering 13,200 km across the countries of Armenia, Azerbaijan, Georgia, Iran, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan, and the North and North-Eastern Asia network along China, the Democratic People's Republic of Korea, Mongolia, the Republic of Korea and the Russian Federation (44,745 km). The rail infrastructure linking Eastern Asia with Europe via China, Kazakhstan, Mongolia, the Korean Peninsula and the Russian Federation has been completed, but in other sub regions 8,300 km of rail links are missing. However, improvements such as government cooperation to construct a 105-km rail section between Kars (Turkey) and Akhalkalaki (Georgia) are being achieved.

The SPECA's PWG on Trade is engaged in trade facilitation to overcome the obstacles and achieve trade integration. It supports the development of networks of policymakers that focus on building regional cooperation in trade policy issues, and project implementation in areas such as: WTO accession; Aid for Trade; preferential trade agreements; legislation supporting e-commerce and trade.

The following achievements within the SPECA programme are relevant for the purpose of this study:

- Progress in the development of the common CIM/SMGS consignment note, which was introduced in 2006 to reduce the delays resulting from incompatible regulations. The common CIM/SMGS consignment note is used for more than fifty traffic flows over four

TEN corridors and therefore, covers more than half the CIM/SMGS traffic: A ¾ percentage of this traffic consists of containers (less than 5% single wagonload traffic). It is calculated that the use of the common CIM/SMGS consignment note leads to a saving of some forty minutes per wagon or eight to ten hours in the total transit time of a train and a saving of some €40 per consignment. Further simplifications are expected from the establishment and consolidation of the customs union between the Russian Federation, Belarus and Kazakhstan, because the common CIM/SMGS consignment note can serve as a customs transit document.

- Progress of SPECA member countries in establishing/strengthening national coordination mechanisms for trade and transport facilitation.
- Progress regarding the organisation of container block train services in the SPECA region by UNESCAP has implemented demonstration runs of container block-trains along the Trans-Asian Railway Northern Corridor linking China, the Korean Peninsula, Kazakhstan, Mongolia, and the Russian Federation. Those runs have shown the capabilities of international freight rail corridors to serve international trade between Asia and Europe.
- Progress in the development of four SPECA transport databases on road and rail routes of international importance, border crossing and intermodal transport infrastructure in the SPECA region.
- The support on unofficial bilateral consultations on border crossing issues between Kazakhstan and Turkmenistan.
- Progress regarding the Single Window project: Finalisation of its first phase in Azerbaijan with functioning Single Window modules at its borders, support of UNECE and GIZ for the Single Window project in Kyrgyzstan, developments in Kazakhstan, Belarus and the Russian Federation including the project as a priority, development assistance of UNECE in Uzbekistan and the organisation of conferences and capacity building events on the issue.
- The continued cooperation of the Inter-parliamentary Assembly of EurAsEC and UNECE on identifying the legal impediments to trade facilitation, the Single Window and data harmonisation and e-commerce in order to harmonise the related legislation in the EurAsEC Member States regarding trade procedures, e-commerce and information exchange.

2.3 Monitoring indices

2.3.1 CAREC Corridor Performance Monitoring

The “Corridor Performance Measurement and Monitoring” (CPMM) was established to monitor the results of the CAREC Action Plan and review corridor performance, in order to ensure that it meets all standards and to allow further comparison between competing corridors. Its main purpose is to identify key cargo transport routes and bottlenecks by (i) analysing the cost and time factors required to transport goods along certain routes; (ii) comparing — over a period of time — the changes in costs and/or time required to transport goods on a certain route; and (iii) comparing and evaluating competing modes of transport on the same route.

CPMM is based on a refined and expanded Time/Cost Distance (TCD) Methodology to gather and process time and cost data for transit transport along a particular route. With the collaboration of 14 freight forwarders and carrier associations, drivers travelling along the six CAREC corridors are randomly selected to fill out a drivers’ form. The results for each corridor are compiled as follows:

(i) Speed Indicators including Speed without Delay (SWOD) and Speed with Delay (SWD)[16],;

(ii) Time spent on delays by different activities previously defined, (over a standard distance of 500 km) as well as transport and activity costs (per 20 tonnes/500 km on road and per TEU/500 km on rail) including unofficial payments; and

(iii) BCPs and Bottlenecks.

Data are collected monthly and CPMM reports are prepared quarterly and annually[17]. Road accounts for 73% of the samples, rail for 19% and the rest multimodal (8%).The following are the main findings of the 2010 CPMM annual report:

- The most common products carried across Central Asia by rail were machinery (18%), wood (15,8%) and metals (14,4%) whereas by road the main products were general merchandise (21,4%), vegetables (14,7%) and machinery (13,5%)
- Cross border shipments decreased from 79% in 2009 to 76% in 2010, but this might be due to difficulties in collecting material at some regions.
- Azerbaijan, Uzbekistan, and Kazakhstan reported extensive use of TIR[18], which avoids time-consuming inspections across intermediate borders.
- Speed to travel 500 km on the CAREC Corridor section for a 20 tonne truck or a TEU container was 37,6 kph (SWOD) and 16,6 kph (SWD). SWOD along road corridors (31,6 – 54,5 kph) is generally higher than on rail corridors (1,3 – 49,7kph). However, since border crossing activities reduce speed on road transport (38% - 74%) to a greater extent that by rail (30 - 56%), rail transport is sometimes quicker (in corridors 1, 3 and 6) than road, when taking into account delays. Regarding CAREC Corridors, which (partly) comply with RETRACK Routes (1a, 1b, 2a, 2b, 3a, 4, 6a and 6b), rail transport on corridors 1a and 6b is quicker both with and without delays than road. If we only consider speed with delay then rail transport on corridors 1b and 3a is also more advantageous than road transport. Further details can be found in the Annex 2.
- The cost[19] to travel a corridor section was $441,20 (median) / $1,247,70 (average) and it was $155,60 (median) / $277,70 (average) at a border crossing clearance. Transport costs for road transport are higher in Corridors 2 and 6, when compared to rail and on rail transport on the corridors 1, 3 and 4, when compared to road. The activity costs are higher for rail in the corridors 1 and 4 and for road in corridor 2.
- Rail transport encounters fewer delay activities than road transport, but the most frequent causes for delays[20] are generally more time consuming in rail transport. The most time consuming are the changes of railway gauge (43h), waiting/queuing time (23,8h) and security services (5,1h). In the case of road transport the most time consuming activities are escort/convoy (11,5h), waiting/queue (4,2h) and loading/unloading (3,8h).
- Change of rail gauge ($143,20)[21], loading/unloading ($63,00), and transhipment ($34,00) were the most expensive activity reasons for railway transport in 2010, showing an increase regarding changing rail gauge and a reduction regarding transhipment activities, when compared with 2009. When it comes to road, the activities have also become more

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16 SWD includes the stoppage time as well as travelling time as well as a coefficient of variation (CV), which measures the predictability of the travel time taken

17 http://cfcfa.net/cpmm/ shows key results for the CAREC region and for each country.

18 To use TIR at least one leg must include road transport.

19 Average cost is measured per 20 tonnes / 500km for road transport and per TEU / 500km for rail transport.

20 Average delay is measured in hours per 500km for both road and rail transport

21 Average cost is measured per 20 tonnes / 500km for road transport and per TEU / 500km for rail transport.

expensive with transhipment ($403,10), loading/unloading ($215,40), and customs clearance ($115,20) being the most expensive.

– Several BCPs were reported as having long customs clearance procedures. Some of them are within RETRACK routes: Dostyk (KAZ) – Alashankou (PRC); Alat (UZB) – Farap (TKM), Konysbaeva (KAZ) - Yallama (UZB), and Sukhbaatar (MON) – Naushki (PRC) and Zamyn Uud (MON) – Erlian (PRC). Table 1 gives an overview of the most significant time costing activities at these BCPs.

Table 1: BCP and major time costing activities (in hours) for rail and road transport

BCP	Corridor	Waiting time (h)	Custom clearance (h)	Loading/ Unloading (h)	Other (h)
Rail: Dostyk (KAZ) – Alashankou (PRC)	1	32 16	2 1	1 3	3 at border security
Rail: Sukhbaatar (MON) – Naushki (RF)	4	- 43	21 -	- -	
Road: Alat (UZB) – Farap (TKM)	2b	- 3	- 1	17 5	
Road: Alat (UZB) – Farap (TKM)	3a	6 4	2 3	12 21	2 at border security and environmental/ ecological checkpoints at both points
Road: Konysbaeva (KAZ) – Yallama (UZB)	3b	2 13	2 3	- -	erratic operating hours/ unannounced closures at Yallama
Road: Altanbulag (MON) – Khiagt (RF)	4	- -	2 2	9 4	
Rail & road : Zamyn-Uud (MON) – Erlian (PRC)	4	3 3	3 3	9 5	

Source: CAREC Corridors Performance Measurement and Monitoring. Annual Report January 2010 to December 2010, June 2011.

The CPMM confirms that transporting freight along CAREC corridors continues to be time-consuming and expensive, with main reasons for this being long customs clearance procedures, loading and unloading, unofficial payments and change in rail gauge. Police checkpoints along certain sections and the waiting for escort/convoy services also causes delays for road transport. By working on the poor physical infrastructure, poor utilisation of inspection and information communication technologies and inadequate trade logistics facilities at the BCPs, a significant portion of delays could be improved.

2.3.2 TRAX TRACECA

The TRACECA Route Attractiveness Index (TRAX) measures the (un)attractiveness of TRACECA routes from the perspective of a freight forwarder: the higher the index is, the less attractive the route is. Further objectives are to determine preferences in the route selection of transport operators; to reveal deficiencies affecting TRACECA attractiveness; prioritise actions to improve attractiveness with the maximum impact; and carry out the monitoring of TRAX periodically.

Data is collected from two sources: (1) IRU - “drivers’ journals” that have been pursued in the IRU’s NELTI framework project; and (2) Questionnaires developed by the TRAX experts and used for interviews with the operators to weigh criteria. The TRAX Index aims to be an

Intermodal index, which will include railway and road transport links. Currently, only the results for road are available.

The Route Index - INDEX (R) comprises two sub-indices: (1) Stretch Index INDEX[22], S and (2) Node Index INDEX, N[23].

So far TRAX has analysed the attractiveness of two TRACECA road routes, the Caucasus and the Turkey/Iran routes, and an alternative (non TRACECA) route through the Russian Federation, and it has compared their indices. The results of the 2009 TRAX survey have shown that the Trans-Russian route is the most attractive, both according to the general Index, as well as its components (travel cost, time cost, reliability and safety/security). TRACECA Trans Turkey road route's results are also by far more positive than those along the Trans Caucasus route, especially those regarding safety/security and travel costs.

Table 2: TRAX General Index

TRAX Index	Index	Travel Cost	Time Cost	Reliability	Safety/ Security
Trans Russia	3,032	1,255	6,767	6,373	72
Trans Turkey	6,358	1,896	7,776	8,839	76
Trans Caucasus	8,169	2,994	11,243	10,849	146

Source: TRAX TRACECA Route Attractiveness Index 2009, 2010.

When it comes to analysing, the advantage of Trans Russia over Trans Turkey is only slight on road and port stretches in the TRAX Stretch index. The Trans Caucasus's attractiveness is largely more negative when compared with any of the other two routes, but is most negative with regards to travel costs and safety/security.

Table 3: TRAX Stretch Index

Stretch Index	Index	Travel Cost	Time Cost	Reliability	Safety/ Security	Hrs	Km
Trans Russia	1,160	442	3,619	955	514	84	5,004
Trans Turkey	1,192	457	3,723	969	533	87	5,384
Trans Caucasus	2,368	1,572	5,541	1,862	1,662	139	5,740

Source: TRAX TRACECA Route Attractiveness Index 2009, 2010.

The ranging with regards to attractiveness at nodes (border points, ports, transhipment points and logistics centres) is the same, with the gap between Trans Russian and any of the TRACECA routes being larger than that on stretches and again more so in terms of travel costs. The advantage of Trans Turkey over Trans Caucasus is not as great, but is still considerable.

[22] (S) is calculated as a sum of the main Stretch criteria (Adjusted weights of Transportation Costs / Time / Reliability / Safety and Security) multiplied by the specific weight of each these criteria, noting that stretches are roads or ferries

[23] (N) is calculated as a sum of the main Node criteria (Average Total costs / Time and Reliability throughout the node) multiplied by the specific weight of each these criteria, noting that nodes are border points, ports, transhipment points, logistics centres

Table 4: TRAX Node Index

Node Index	Index	Travel Cost	Time Cost	Reliability	Hrs	Nodes
Trans Russia	2,053	813	3,148	5,418	73	6
Trans Turkey	5,353	1,440	4,053	7,870	94	5
Trans Caucasus	6,493	1,964	5,702	8,987	129	8

Source: TRAX TRACECA Route Attractiveness Index 2009, 2010.

TRAX also enables the calculating of attractiveness of certain segments within each route, showing that routes are not uniformly attractive. Along the Trans Russian route the Belarus' section is the most attractive when considering the general index and in terms of nodes, but the less attractive in terms of stretches. The nodes in Kazakhstan, Uzbekistan and Kyrgyzstan are far less attractive than those in Belarus or the Russian Federation. TRAX also allows the identification of the main problems, which prevent a route from developing a higher attractiveness. For example, along the same corridor in the Russian Federation nodes are less attractive than stretches. By improving attractiveness of nodes, the general attractiveness of this section would be even higher. In the Trans Caucasus route the nodes are also the main factor responsible for reducing the attractiveness of the routes along all segments.This happens mainly in the Ukraine, Romania and Bulgaria sections, where the node index accounts for 80% of the general index. Despite this, Georgia, Azerbaijan and the Black and Caspian Seas are still the less attractive part of this route, mainly because of the higher TRAX stretch index due to ferry crossings. On the Trans Turkey route the stretch index is similar along all sectors, but TRAX on nodes is roughly four and three times higher in Iran and Central Asia than in the section crossing Bulgaria and Turkey.

From the results it can be concluded that Trans Russian is the most attractive route for the road transport sector and that the main problems preventing the routes from attracting a higher freight volume are nodes in terms of travel and time costs and reliability. For Trans-Caucasus route, ferry crossings contribute largely to its low attractiveness. The segment crossing Georgia, Azerbaijan and the Black and Caspian Seas has the highest TRAX index of all routes, followed by Iran. TRAX stretch index is also highest in the same region while Iran holds the highest TRAX node index. Further results as well as documents explaining the methodology and the questionnaire can be downloaded at www.traceca-org.org.

2.3.3 LPI the World Bank

The Logistic Performance Index (LPI), developed by the World Bank, measures performance along the logistic supply chains in different countries. The LPI is based on a worldwide online survey of logistic professionals from the multinational freight companies and the main express carriers and includes all transport modes (air, maritime, rail and road).

LPI's main goals are (i) helping countries to identify its challenges and opportunities in trade logistics as well as possible actions to improve their performance; (ii) focus attention on an issue of global importance and provide a platform for dialogue between the government, businesses, and civil society; (iii) serve as a catalyst, helping policymakers and the private sector build the case for domestic policy reform, for investment in trade-related infrastructure, and for the regional and multilateral cooperation. The LPI index has domestic and international perspectives.

The LPI international is a weighted average of scores on the following six issues: efficiency of the customs clearance process, quality of trade and transport-related infrastructure, ease to arrange competitively priced shipments, competence and quality of logistics services, ability to track and trace consignments and frequency with which shipments reach the consignee within the scheduled or expected time. Each respondent valued each of the former items – from 1 (worst) to 5 (best) – for the 8 major countries that his/her company trades with.

The domestic LPI provides both qualitative and quantitative assessments of the country the logistics professionals work in. It comprises qualitative detailed information on costs, quality of trade and transport related infrastructure, competence and quality of service providers, service efficiency, frequency of delays and informal payments and clearance improvement/deterioration compared to 2005. Respondents also provided quantitative information on time/cost data for import and export transactions and for different portions of the transactions (export pre-carriage, export carriage, import on-carriage and import carriage) and customs administration and procedures, such as clearance time, efficiency, customs valuation including methods to determine the conduction of inspections, use of electronic submission, pre-arrival clearance, post-clearance audit procedures, and transparency of customs procedures and administration (including the extent of industry consultation, advance notification of regulatory changes, and availability of review or appeal procedures).

Table 5 summarises the main results of the "2010 LPI" for RETRACK countries. Results on the international LPI for Belarus are not available. Georgia and Moldova did not participate in the survey, i.e. there are no results on the domestic LPI for these countries.

Twelve of the 18 countries represented are below the LPI world average. Among them are all the countries located in Central Asia, Mongolia, the Russian Federation and two Eastern European countries: Bulgaria and Romania. The PRC is above the world average and Germany is at the top of the LPI international ranking. Mongolia shows the lowest LPI value of the RETRACK countries.

International LPI refers to all modes of transport, while domestic LPI gives more detailed information on infrastructure, level of charges and quality of services within each transport mode. Mongolia, Hungary, Belarus and the Slovak Republic have (very) high fees in rail transport. This does not necessarily mean a better quality in the rail infrastructure in the case of Hungary, which shows the greatest dissatisfaction in this regard. Serbian and Bulgarian respondents also consider the quality of the rail infrastructure to be (very) low in their own country (100% and 75%, respectively). 100% of the respondents in Romania consider port fees in their own country to be (very) high but, at the same time, 66,7% of them rate the quality of the port infrastructure as (very) low. In Turkmenistan 100% of the respondents evaluate the latter as (very) poor. In Azerbaijan and Turkmenistan both port and rail infrastructure is considered to be of low or very low quality and fees in both transport modes are considered (very) high by 50% of the respondents. In addition, none of both countries evaluated the quality of services of these or any other elements within the logistic chain positively. Almost half of the respondents in Kazakhstan consider the quality of the rail services high or very high, but otherwise, and excluding Germany, the respondents evaluated the quality of the rail services as very low. None of the respondents consider Azerbaijan, Belarus, Bulgaria, Hungary, Mongolia, Romania, Serbia, Slovak Republic and Turkmenistan to have high quality rail services. Dissatisfaction with the competence of health and SPS agencies is high in those countries and in most of them this also applies to other border agencies such as customs and inspection agencies. Only the respondents from Germany are largely satisfied with them. Turkey, Bulgaria, Poland, Ukraine and Mongolia show some level of satisfaction, even if not consistent among the different bodies.

Table 5: LPI International (1 is best and 5 is worst)

Country	LPI	Customs	Infra-structure	Inter-national shipments	Logistics competence	Tracking & tracing	Time-lineness
Azerbaijan	2,64	2,14	2,23	3,05	2,48	2,65	3,15
Bulgaria	2,83	2,50	2,30	3,07	2,85	2,96	3,18
Georgia	2,61	2,37	2,17	2,73	2,57	2,67	3,08
Germany	4,11	4,00	4,34	3,66	4,14	4,18	4,48
Hungary	2,99	2,83	3,08	2,78	2,87	2,87	3,52
Kazakhstan	2,83	2,38	2,66	3,29	2,60	2,70	3,25
Moldova	2,57	2,11	2,05	2,83	2,17	3,00	3,17
Mongolia	2,25	1,81	1,94	2,46	2,24	2,42	2,55
Poland	3,44	3,12	2,98	3,22	3,26	3,45	4,52
PRC	3,49	3,16	3,54	3,31	3,49	3,55	3,91
Romania	2,84	2,36	2,25	3,24	2,68	2,90	3,45
Russian Fed.	2,61	2,15	2,38	2,72	2,51	2,60	3,23
Serbia	2,69	2,19	2,30	3,41	2,55	2,67	2,80
Slovak Rep.	3,24	2,79	3,00	3,05	3,15	3,54	3,92
Turkey	3,22	2,82	3,08	3,15	3,23	3,09	3,94
Turkmenistan	2,49	2,14	2,24	2,31	2,34	2,38	3,51
Ukraine	2,57	2,02	2,44	2,79	2,59	2,90	3,06
Uzbekistan	2,79	2,20	2,54	2,79	2,50	2,96	3,72
Europe and Central Asia*	2,74	2,35	2,41	2,92	2,60	2,75	3,33
World average	2,87	2,59	2,64	2,85	2,76	2,92	3,41

Source: www.worldbank.org;

**Europe and Central Asia includes Albania, Armenia, Azerbaijan, Borsnia and HerZegovina, Bulgaria, Georgia, Kazahstan, Kyrgyz Republic, Latvia, Lithuania, Macedonia, Moldova, Montenegro, Poland, Romania, Russian Federation, Serbia, Tajikistan, Turkey, Turkmenistan, Ukraine, Uzbekistan.*

Efficiency, however, scores considerably higher in nearly all countries. However, respondents in Azerbaijan and Belarus are clearly unsatisfied with all processes (clearance, transparency of customs and provision of information). Transparency of customs was also very poorly evaluated in Hungary, the Russian Federation and Turkmenistan. Simultaneously, the Russian Federation and Turkmenistan together with Azerbaijan and Mongolia report the solicitation of informal payments as a frequent cause of delays (73% and 100% respectively). Compulsory warehousing and transloading and pre-shipment inspection contribute to at least 50% of delays in Azerbaijan, Hungary, the Russian Federation and Uzbekistan. This is also a frequent cause for delays in Romania. Maritime transhipment is an issue in Azerbaijan and Bulgaria. In addition, criminal activities make for nearly half of the delays in Azerbaijan.

Clearance time without physical inspection is the longest in Azerbaijan (4 days), in Uzbekistan (2,87) and in the Russian Federation (2,57). However, physical inspections double the clearance time in Germany, Hungary, PRC, Slovak Republic, Turkey and Ukraine, and even triple it in Belarus. As a result, in nine countries clearance time with physical inspection takes 2 or more days. Countries where such physical inspections take place more frequently are Azerbaijan (75%), Ukraine (50,8%), Uzbekistan (49,3%), the Russian Federation (44,2%) and Kazakhstan (42,3%). Multiple inspections are frequent in Azerbaijan and Mongolia.

However, improvements have been undertaken in Poland, Romania and PRC, where respondents have reported great improvements in many different areas: clearance procedures, trade/transport and telecommunications/IT infrastructure, private logistic services, regulations and incidence of corruption. Countries that have experienced very few improvements are Azerbaijan and Hungary.

Most of the represented countries are below the world average and even below the regional average, thus there is a necessity for improvement. The quality of the infrastructure is the lowest at ports and in rail transport, but also poor on/along the roads. Respondents are widely disappointed with the quality of the rail services and the competence of health and SPS agencies. The services of trade and transport associations, custom brokers and consignees and shippers also need to be improved. The main issues responsible for causing delays are pre-shipment inspections, informal payments and compulsory warehousing and transloading. On the other hand, there are also positive improvements in private logistic services, telecommunications and IT infrastructure and customs clearance. Nevertheless, measures to improve clearance time and efficiency of inspection procedures, as well as to reduce corruption and informal payments are urgently needed. Moreover, there are great differences in logistics performance across the RETRACK countries from top performers such as Germany (1st place in LPI ranking) to low performers such as Mongolia, ranking 141 out of 155 countries. A special case is PRC, which shows higher logistic performance scores, than those expected from its income level.

More detailed information on LPI for the RETRACK countries can be found in Annex 3.

2.4 Block train runs

2.4.1 Trans Eurasia – Express

The Trans Eurasia Express is a service that was founded in 2008 and is operated by TEL Trans Eurasian Logistics, a joint venture between DB AG and the Russian Railways (RZD). Its further partners are TransContainer, Polzug and Kombiverkehr[24]. TEL has offices in Berlin, Moscow and Beijing and its goal is to shift more container traffic between Europe and Russia/CIS/Asia to rail by means of creating the best possible conditions for reliable container rail traffic between these regions. The services are particularly suitable for the freight transport of goods whose delivery time lies between air and sea freight, in particular for high-value and heavy cargo. The Trans Eurasia Express offers mainly two options of container rail freight transport: the company train and the public train. Table 6 summarises the characteristics of both.

24 Talks are being held to get the Chinese Railways involved in the Joint Venture.

Table 6: Overview of services of public and private trains by Trans Eurasia Express

The public train	The company train
Fixed terminal-to-terminal transit time	
Daily progress monitoring through two GPS units on each block train over the entire route	
Security guaranteed with permanent surveillance and armed guards on CIS route	
Block train for multiple customers	Train exclusively for one customer
Scheduled departure dates and frequency according to a timetable (at least one weekly)	Flexible frequency as requested by the customer
Fixed departure and destination terminals	Free choice of sources, drains and routings according to customer's request

Source: http://www.trans-eurasia-logistics.com, "The Trans Eurasia Express: the new transport solution between Asia and Europe" brochure.

Currently there are only regular services (public train) operating on a weekly basis between Germany and the Russian Federation but train services have been successfully tested between Europe and China and are at present being offered as the "company train" alternative.

Figure 5: Trans Eurasia routes

Source: http://www.trans-eurasia-logistics.com

The regular container train "Moscovite" (launched in June 2010) has a leading time from Germany to the Russian Federation of 7 days. The stop in Brest/Malaszewicze serves the purpose of changing the gauge from 1435mm to 1520mm. It is also a hub for connections to multiple destinations within the Russian Federation, Belarus, the Ukraine and Kazakhstan. It is common practice that one CIS-train with a length of 1,000 m is formed by two EU - European wagon- trains with a length of 500 – 600 m arriving or departing at the Poland – Belarus gauge change stations. Containers from other origins, such as Hamburg, Bremerhaven, Rotterdam, Antwerp, Eastern and Southern Germany or Poland, can also be loaded on the Moscow-bound Moscovite at Brest.

From Moscow it is possible to reach PRC in 10-12 days with the company train option via one of the following routes: (i) Mongolia – PRC, (ii) Kazakhstan – PRC and (iii) Zabaykalsk/Manzhouli - Beijing/Shanghai.

The haul from China to Germany (approximately 12,000 km) takes 18 days. The following routes are currently offered as the company train: (i) Beijing/Shanghai/Chongqing - Zabaykalsk - Novosibirsk - Yekaterinburg - Moscow - Brest – Duisburg, (ii) Beijing/Shanghai/Chongqing - Zamyn Uud - Naushki - Novosibirsk - Yekaterinburg Brest –

Duisburg, and (iii) Beijing/Shanghai/Chongqing - Dostyk - Petropavlovsk - Yekaterinburg - Moscow – Brest - Duisburg.

A new container train tested in March/April of 2011 further reduced the leading time to 16 days from Chongqing to Duisburg (10,300 km). The route through the south of Mongolia, Kazakhstan, Russia, Belarus and Poland to Germany is 2,000 km shorter than the route through the north of Mongolia but involves more customs formalities. Another company train, the Fujitsu Siemens Computers, covered more than 10,000 kilometers in around 17 days from Xiangtang (around 700 kilometers north of Hong Kong), crossing China and Mongolia to the Russian border at Irkutsk and then following the route of the Trans-Siberian railway via Novosibirsk to Moscow. From there it travelled across Belarus and Poland to Hamburg. The company train carried 50 containers with valuable IT products such as monitors and chassis.

2.4.2 East-Wind project

IRS InterRail Services GmbH, founded in May 2000 by TransRail (today TransInvest group) and Intercontainer-Interfrigo SA, is responsible for the development and the operation of the Ostwind container block train, first implemented in 1995.

The Ostwind departs from Berlin-Grossbeeren, which serves as a hub to other stations in Germany, Belgium and the Netherlands, and runs along the Pan-European Transport Corridor II via Malaszewicze/Brest to Moscow-Bekassovo and further to all CIS countries and Mongolia, China and other destinations in Eastern Asia.

Figure 6: Ostwind Network

Source: www.interrailservices.com

The Ostwind leaves Berlin-Grossbeeren to Moscow-Bekassowo three times a week. The leading time to Brest/Malaszewicze is 20 hours and from there to Moscow-Bekassowo is 7 days. The waiting time at the EU/Belarus border is 12-13 hours, where SMGS consignment notes are completed, whereas at Brest waiting time is 1-2 days, depending on the wagon availability. The average transport time between Berlin-Grossbeeren and the main stations in Central and Eastern Asia are the following: Omsk (RF) (11 days), Yekatarinburg (RF) (12 days), Baku (AZB) (15 days), Irkutsk (RF) (15 days), Tashkent (UZB) (15 days), Almaty (KAZ) (16 days), Mongolei through Naushki (16 days), Alamedin (KYR) (17 days), and Vladivostok (RF) (20 days).

The Ostwind offers a high degree of transport security over the entire distance; no reloading of the goods at the CIS border; reliable connections, door-to-door transport for consignees in Moscow; tracing facilities from origin to destination; provision of SMGS bills at Malaszewicze for the CIS railways; free selection by shippers between transport with their own containers or the rental of CIS containers, according to the parameters allowed.

"Csardas", the container system from Sopron on the Hungarian border to destinations in the CIS, is also part of today's market oriented IRS transport and logistics system. Cargo can be pre-carried from Austria via rail, but the majority of the containers are trucked from Southern Germany, Austria and other regions. There are daily departures from Kuntsevo 2 in Moscow to Budapest[25].

2.4.3 Kazakhstan vector

Kaztransservice, in cooperation with Belarusia's official transport and logistics company "Belintertrans-Transport-Logistic-Centre", are responsible for the operation of the Kazakhstan Vector which began running in 2002[26], as a result of the successful railway administrations' cooperation between Belarus and Kazakhstan. Further partners of the container rail service are Polzug Intermodal GmbH, Polzug Polska, UAB TEF Vilteda and Rubikon. The container train runs on the route Brest – Aktobe – Arys – Dostyk/Alashankou passing through the Osinovka (Belarus) – Krasnoe (Russia) – Ozinki (Kazakhstan) border crossings. The destination stations are in Kazakhstan, Uzbekistan, Turkmenistan, Tajikistan and Kyrgyzstan.

Figure 7: Trans-Kazakhstan Vector

Source: www.rw.by

"The Kazakhstan Vector" operates twice a week[27] and covers 4,502 km in 6 days and 15 hours. This means an average speed of 679 km/days[28]. In 2007 it carried 9,320 TEU from Brest through Iletsk to Arys. This was 1,2 times faster than in 2006. A new agreement between the two main operators will allow the current service to be extended to Dostyk and China[29] in the near future. Equipment for industry and agriculture, consumer goods and the production within food industry are expected to be the main commodity cargoes.

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25 ECE/TRANS/WP.5/2007/3 from 3 July 2007 (Session of the Working Party on Transport Trends and Economics)

26 http://www.rw.by

27 ECE/TRANS/WP.5/2007/3 from 3 July 2007 (Session of the Working Party on Transport Trends and Economics)

28 http://www.kts.kz

29 EDB Eurasian integration Yearbook, ADB 2009

The international container block train «Kazakhstan vector» will expectedly run on the following routes:

1. China–Western Europe:

   – Port Shanghai – Dostyk – Astana – Brest – Warsaw– Hamburg (distance 11,096 km – 11,096 km).
   – Port Tianjin – Dostyk – Astana – Brest –Warsaw – Hamburg (distance 10,538 km).

2. China – Baltic States:

   – Port Shanghai – Dostyk– Astana – Minsk – Vilnius – Klaipeda (distance 10,369 km).
   – Port Tianjin – Dostyk– Astana – Minsk – Vilnius– Klaipeda (distance 9,811 km)[30].

2.4.4 The Mongolian Vector

The railways of Mongolia (Tuushin), the Russian railways (Rubikon) and the Belarusian railway (Belintertrans) were the operators of the first Mongolian Vector train on the route Brest - Naushki - Ulaanbaator in March 2002. Since 2005 further railway operators have joined the project and the route has been extended from Germany (Duisburg) to China (Hohhot). The main parties responsible for the Mongolian Vector are Rubicon Russia, Belintertrans Belorussia, Tradetrans Poland, Tranza Germany, Argo Bogemiya Czech Republic, Weisai China and Viltida Latvia.

Figure 8: Mongolian Vector

Source: www.rw.by

The complete distance of the route from Germany to China is 9,827 km and the leading time is about 14 days. The distance from Brest to Ulaanbator is 7,293 km and the leading time is 10-12 days. Departures from Brest to Hohhot are scheduled twice a month and once a month in the opposite direction. From Brest to Ulanbaator departures are weekly (and daily up to Naushki). For the complete route from Hohhot to Duisburg there are monthly departures[31].

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30 http://www.brit.by

31 ECE/TRANS/WP.5/2007/3 from 3 July 2007 (Session of the Working Party on Transport Trends and Economics)

2.4.5 Other container train services

The DB Schenker China Express connects Leipzig to Shenyang. It takes 23 days to cover a distance of 11,000 km. The containers have to be transferred by crane to different gauges twice – first to the Russian broad gauge at Brest and then back to the standard gauge at the Russian-Chinese border at Manzhouli, while leaving out shunting at Moscow Bekassovo or Yekaterinburg. Commodities transported by this train are: chemicals and auto parts from the BMW plan

Table 7: Container block train runs in Russia, Central Asia and China

Route	Frequency	Leading time
Lian yung gang, Tianjin, Qinydao, Shanghai, Wenzhou, Xiamen, Guangzhou, Shenzhen, Xi'an, Lanzhou (China) – Hungary (via Kazakhstan, Russian F., Ukraine)	Once a week	n/a
Almaty (Kazakhstan) – Dostyk (Kazakhstan) /Alaschankou (China)	6 times per week	n/a
Lianyunggang (China)- Alaschankou (China) - /Dostyk Kazakhstan – Assake (Uzbekistan)	Once a week	n/a
Tianjin (China) – Alaschankou (China) / Dostyk (Kazakhstan) – Almaty (Kazakhstan)	3 times per week	n/a
Vostochny (Russian Federation) - Taganrog (Russian Federation)	3 times a week	11 days
Vostochny/Nakhodka (Russian Federation) - Izhevsk (Russian Federation)	7-8 times a week	9 days
Vostochny/Vladivostok (Russian Federation) – Moscow (Russian Federation)	Once a week	11-12 days
Vostochny/Nakhodka (Russian Federation) – Chelny (Russian Federation)	3 times a week	9-10 days
Vostochny (Russian Federation) – Saryagach (Uzbekistan)	Twice a week	14 days
Lian yung gang, Xi'an (China) – Alataw Shankou / Dostyk – Iletsk-1 (Kazakhstan) – Suzemka / Zernovo (Russian F./Ukraine) – Izov (Ukraine) – Khrubeshuv/ Slavkuv (Poland)	Panned	n/a
Poti-Baku	No fixed timetable	n/a

Source: UN Economic and Social Council, ECONOMIC COMMISSION FOR EUROPE INLAND TRANSPORT COMMITTEE, Working Party on Transport Trends and Economics, Twentieth session, Geneva, 13-14 September 2007 on DEVELOPMENT OF EURO-ASIAN TRANSPORT LINKS; UN Working group documents

Baltic – Transit Container train is a service organised by Fesco Transportation group. Company offers rail transportations from the Baltic states to Kazakhstan, Central Asia states, Afghanistan and China using container block train. Container trains are dispatched 2-3 times a week in accordance with schedule. Offered transit time to Almaty is 12 days.

Western Europe and Central Asian countries are also connected by the container block trains which are operated by one of the largest Latvian forwarding company – SRR. The route of container block train Eurasia 2 connects Riga with the main destination points in Central Asia: e.g. Almaty, Bishkek, Tashkent, Dushanbe and Afghanistan. Average transit time is 10 days on the way. Cargo is usually delivered by short sea to Riga and further put on rail to Moscow – Iletsk – Almaty.

One of the most recent initiatives is Duisburg – Tiantsing container train run organised by «Kaztransservice", "DBSchenker Rail, "BTLC" (Belarus), Trans Container (Russia). The train follows itinerary: Duisburg (DE) – Malasheviche (PL) – Brest (BEL) – Iletsk I (RF) – Dostyk (Kaz) – Tiantsing (PRC). The demonstration train run, containing 36x40 TEU with computer equipment, took place in March 2011. Since, couple of more trains were organised on this route. The distance is covered in 16 days in average. t. Since late November 2011 the trains have been departing on a daily basis.

Above, in table 7, are some other container train services between Europe and China that took place before 2007 and that are the most relevant for RETRACK).

2.5 Study for the project of the integrated logistics system and marketing action plan for container transportation (Kazakhstan)

In 2006-2007 the Japan International Cooperation Agency (JICA), in cooperation with the Ministry of Transport and Communications (MTC), Trans Kazakhstan Railway (KTZ), Kaztransservice (KTS) and other related administrative organisations, conducted a "Study for the Project of the Integrated Logistics System (ILS) and Marketing Action Plan for Container Transportation".

The objectives of the study were (i) to enhance domestic and international cargo movements by developing a comprehensive logistics system focused on container cargo transport by the national railway. This was to be presented in the form of a marketing plan (target year 2017); (ii) to present the outcome of the feasibility study on the modern cargo handling facilities to be established at the border railway entry points for east-west transit cargo (Aktau and Dostyk); (iii) and to promote capacity-building among the parties concerned in Kazakhstan, while implementing the study.

Firstly, the study described the existing logistic conditions in Kazakhstan and the Eurasian Region. Below is a summary of some of the critical issues that were identified for 2007 and prior to that year:

- Road transportation is mainly used for medium- or short-distances (domestic cargo) and rail for long distances (international cargo). The average transport length of railway and truck deliveries is 785 km/t and 31 km/t, respectively.
- In 2005, the railway share in the total freight transport volume (296.3 billion tonne/km) was 58% (78%, if pipeline transport is excluded). The share of road transport was 16% and 22% respectively. Road transport was expected to continue growing because (i) it drives the economic activity; (ii) there is an increase in the demand for transportation from door-to-door; (iii) offers flexible time schedule; and (iv) it covers transportation needs related to oil.
- Main export commodities by rail were coal (37%), ore (20%) and oil (19%). By road, the main import commodities were wood and woodworks, machinery and equipment, whereas food and vegetables and construction materials were the main export commodities.
- Origin of international freight cargo by rail was mainly the Russian Federation (46%), Uzbekistan (17%) and PRC (11%); the main destinations were Uzbekistan (31%), the Russian Federation and Tajikistan (at 15%). PRC shared 8%. The origin and destination of international freight cargo by road was mainly in Russia (41%) and Kyrgyzstan (33%). PRC shared 9% and Europe 8%.
- Existence of a considerable number of over-aged locomotives and wagons, according to an inventory carried out in 2003-2004. The number of container cars was also insufficient.

- The rail freight operation system was based on old methods such as assembling and disassembling freight cars at each freight yard and telephone/telegram based on-rail information transmission.
- The Dostyk terminal was congested because of the lack of transhipment facilities for both containers and general cargo, and bogies for containers. In addition, long times for yard and customs operations were needed. In 2007, Dostyk transhipped 109,700 TEUs, this representing already an increase of 37%[32] when compared to 2006. In 2005 82% of all freight from Dostyk was exported from Kazakhstan to China and 18% from China to Kazakhstan. Therefore, empty wagons had to often be sent back to Kazakhstan from the Chinese side (Alashankou). The opposite happened in container transport, as container cargoes from China increased. Of the exports heading China, 12% was on transit- mainly coming from the Russian Federation and Uzbekistan-, the rest originated in Kazakhstan. Of the imports entering from China, less than half (41%) was on transit-mainly to Uzbekistan, the Russian Federation and Tajikistan.
- The Aktau Port had already reached the limit of its capacity. Most ships were only equipped to carry bulk cargo and needed to develop capacity for carrying container cargo. The main commodity trade at the port was oil (85%) and steel for general cargo. Although the main export partners were Azerbaijan and Iran, the cargo flows of consumer goods coming from the Western Chinese region and shipped to the Caucasus countries, was growing.
- The custom procedure showed many weaknesses: use of many paper documents for good declarations; lack of comprehensive risk management, computer-based network, IT systems, and (re)training; obsolete equipment and machinery; the need for joint control with neighbouring countries and one-stop border points. The average border crossing time in 2006 was 4 hours and 45 minutes. In addition, the following problems were identified regarding freight entering from PRC at Dostyk/Alashankou: deficient document preparation from the Chinese side; large volume of small shipments; differences in import/export volumes; rigid control function of Kazakhstan's customs.
- The necessity to improve coordination among all the related ministries and agencies involved in logistic issues.

Secondly, the study analysed three alternative rail routes connecting Europe and China through the territory of Kazakhstan. These were: (a) the Trans-Asian Route; (b) the TRACECA Route and the (c) Trans-Siberian Route. All of them were further compared to (d) the All-water Route. Several origins and destinations were proposed and assessed for each route[33].

[32] EUCAM Working Paper "Optimisation of Central Asian and Eurasian Trans-Continental Land Transport Corridors" December 2009

[33] The analysis of competing routes includes other origins/destinations, which are not relevant for this study

Figure 9: Map of analysed competing routes

Source: The Study for the Project of the Integrated Logistics System and Marketing Action Plan for Container Transportation, JICA, December 2007

Based on that evaluation and for travelling between Asia and Europe, each route has advantages and weaknesses. The following conclusions can be led from the analysis. Both the Trans Asian and Trans Siberian Route provide freight transport with a seamless railway route and a minimum number of transshipment points at Dostyk and Brest. However, out of the four routes, the Trans Asian offers, in addition, the shortest travelling distance and the most competitive conditions in terms of transit time and/or transport cost for the cargo originating from the China Coastal Area and China Inland Area. On the other hand, the Trans Siberian, TRACECA Route and the All-Water Route have a longer tradition in connecting Europe and Asia, whereas Trans Asia lacks the recognition in the freight market and some cargo-owners/forwarders hesitate to select this route due to limited transport experience. Further weaknesses of the Trans Asian route are the difficulty to warrant the reliability of transport service (punctuality, safety and cargo information provision), high tariffs for transit cargoes due to policy and the lack of transit cargo traceability, due to a poor cargo information system (this was also happening along the Trans-Siberian route). In addition, due to complex customs procedures on the Russian side, transit times are likely to increase. Transit time is the longest within the All Water Route. In turn this route offers cargoes' traceability and good warrants regarding punctuality as well as the biggest transport capacity and cheaper transport costs due to the existence of several shipping lines. Transport costs are the highest along the TRACECA route. Table and Table 9 give the main results of the analysis for the corridors between China and Western Europe.

Finally, the study also includes a demand forecast, which has been performed on a macro- (international trade freight between Kazakhstan and worldwide regions), meso- (trade freight between Kazakhstan and the neighbouring countries) and micro-scale (domestic trade freight). The main results of this forecast are:

– Total railway freight demand in Kazakhstan is estimated to increase up to about 424 thousand tonnes in 2017 (increase rate is 1,9 times that of the present) with import cargoes increasing the most, followed by transit cargoes and export cargoes increasing the least.

- Transport of natural resource commodities by rail will continue to be the highest, but its dominant position will decrease as general cargoes (including industrial goods and others) will show a moderate increase.
- The container freight in the case of a high growth scenario is estimated to be about 10 million tonnes in 2017. This is 8 times that of the present volume. In case of a moderate scenario the estimate is 5 million tonnes. This is 4 times that of the present volume. The high scenario estimates a 15% growth in container rate which is 3,8 times that of the present rate but is too rapid a growth for the given time span. The probable demand in the future is considered to be materialised between the high and moderate scenarios and annually about 7 million tonnes (18,300 containers and 9,150 wagons).
- The railway network improvement will additionally bring along about 3 million tonnes of cargo in the Kazakhstan railway sections. This volume does not include the demand by the related corridor development.
- Although forecasts for the cargo projections of the Aktau Port in 2015 show that oil transportation (by tank) will remain the most important cargo commodity, the portion of non-oil shipments, though actually very small (about 10%), will increase in the longer term, being estimated at 4,695 tonnes in 2015. About 3,000 thousand tonnes will be steel and grain which usually moves on a full shipload basis and 1,645 thousand tonnes will be pure general cargo. .
- According to a forecast by the Ministry of Transport and Communications (MCT), the future freight demand by truck in 2017 will be 3,616 million tonnes and 663,000 trucks. The implementation of the MCT's plan will create 7,205 km of road rehabilitation within the present year (2012) and raise 86% of the current republican highways up to international standards.

Based on the problems identified and the results of the freight demand forecast, the following main challenges need to be targeted in Kazakhstan: (i) a general increase in freight demand, both domestic and international/transit, which the country might not be able to cope with, unless improvements are made; (ii) new trends in the freight market and changes in Kazakhstan's economy - from a natural-resources-dependent-economy to a multi-industrial and service-oriented economy -, will lead to different freight transport needs. It is therefore necessary to adapt the operation and management of the railways, taking measures in the present to be flexible towards future demands; and (iii) the necessity to improve the railway transportation system' speed, multiple transportation system, modal points, communication systems and service to avoid a modal shift from railway to truck transportation. This tends to occur when upgrading the economic structure and developing the economy.

Table 8: Analysis overview of competing routes for the corridor West Europe-Coastal China

OD: Shangai-Berlin	Trans-Siberia Via Vostochny - Moscow - Brest	All Water Via Rotterdam	Trans-Asian Via Dostyk and Moscow	TRACECA Via Dostyk - Aktau - Baku - Poti
Travelling distance (km)	13,021	20,752	11,777	18,389
Transport costs (US $/ Container)	4,090	4,420	3,765	7,974
Total transport time (day)	22	28	26	42
Transport time	15	25	18	26
Transit time	7	3	8	16
No. of custom / transshipment points	3/2	1/1	4/2	4/6

Table 9: Analysis overview of competing routes for the corridor West Europe-Inland China

OD: Urumqi-Berlin	Trans Siberia Via Manzhhouli - Moscow	All Water Via - Lianyungan - Rotterdam	Trans Asian Via Dostyk and Moscow	TRACECA Via Dostyk - Aktau - Baku - Poti
Travelling distance (km)	13,982	24,660	7,773	14,385
Transport costs (US $/ Container)	3,903	7,520	2,559	6,773
Total transport time (day)	26	38	20	38
Transport time	19	33	12	22
Transit time	7	5	8	16
No. of custom and transshipment points	3/2	1/2	4/2	4/6

Source: The Study for the Project of the Integrated Logistics System and Marketing Action Plan for Container Transportation, JICA, December 2007

Some concrete recommendations include promoting the use of containerisation to easily adapt to its incipient growth and because of its advantages to both freight forwarders and railway operators; improving border crossings, in general, and at Dostyk/Alashankou in particular - as a key point in trade with China (inclusion of information beforehand about containers entering from China, review of reloading facilities, expansion of handling capacity, wagon accumulation, arrival and departure track capacity and number of container cars, improvement of customs procedures including harmonisation of documents and performance of seminars in PRC about Kazakhstan's procedures, balance the problems caused by differences between imports and exports); application of RORO vessels to promote freight transport through the Caspian Sea and improve its capacity; supporting the development of multi-logistic centres with value- added services to improve logistics efficiency and save costs; and improving personal skills in IT and communication systems.

To perform the challenges and remain competitive with other routes, the Container Logistics System Development Plan includes actions and recommendations to be undertaken in multiple areas: Railway, Road Transport Industry, Port and Maritime Transport, MultiModal System including Railway Connection with Ports and Road Network, Logistics Centre, Information and Communication System and Institutional and Human Resource.

2.6 Summary of the recent R&D projects and pilot train runs

There is a need to move towards solutions for future changing patterns in freight demand regarding both trade flow volumes and customer needs (types of goods), before these changing patterns happen. Expected increases in trade between Eastern Asia and Europe, together with an overloaded and time-consuming (though very reliable) maritime transport, mean a great opportunity to increase trade volumes on land corridors and in particular on railways, since this mode is the most appropriate for long-haul distances in terms of time, cost and environmental friendliness. However, rail cannot compete with road transport's flexibility and capacity to supply a door-to-door transport service. This together with the geographic characteristics of the region -with the Black and Caspian Sea basins- suggest an intermodal transport system (with a strong rail component) as the best option to efficiently and competitively develop land transport between Eastern Asia and Europe.

However, as long as rail transport does not overcome the main obstacles it faces, which are numerous in the region, it will not be possible to take advantage of its full potential and capacity. The studies which have been reviewed in this chapter have illustrated that there is a considerable number of problems that railway transport faces in its development in the region. A large constraint that is preventing land transport from developing are bottlenecks at BCP. These are caused by expensive and time-consuming activities related to custom and other agency procedures, such as lack of synchronisation between border agencies, poor infrastructure and equipment, compulsory warehousing, trans-loading/-shipment activities, change of rail gauge and informal payments. Insufficient advance notifications, excessive amounts of documents and the co-existence of non-standardised EDI systems and different legal basis (CIM/SMGS consignment notes) also cause delays at border crossings. Further problems are the insufficient or missing rail network, in particular in west-east direction; obsolete locomotives; low levels of safety and security; existence of different legislations and transport requirements across countries and poor interoperability between different transport modes. Bottlenecks are also registered at the ferry ports of Aktau, Poti, Constanta and Varna, which have already or will soon have reached their maximum capacity.

To improve the performance of land corridors and become more competitive several measures and recommendations have been mentioned in the action plans and strategies of the reviewed studies and initiatives. Targeting non-physical barriers is at least as important as providing the adequate infrastructure. The following measures would aid in the removal of technical and physical barriers; the (re)construction of rail and road networks, the electrification of railways, the upgrading of locomotives and ancillary infrastructure, the installation of common signalling and telecommunication facilities, the standardisation of data exchange systems and the compatibility's improvement of differences in track gauges and rolling stock. However, organisational and legislative measures are also necessary to streamline border procedures, including the further implementation of NSWs and JCC, the extension of risk management and post audit measures to all border agencies, implementation of a single administrative document (SAD), and the adaptation of national customs and safety legislations to international standards. Improving the staff capacity skills and in particular those related to border procedures, the development of multi-logistic centres and the promotion of containerisation are further measures to be mentioned. Monitoring performance has also become an essential tool to identify the main obstacles along the land corridors and follow up results from implementation measures. Furthermore, due to a lack of resources it is essential to concentrate on improving key existing corridors rather than extending the network. Promoting the PPP to increase competitiveness is an important issue regarding rail transport.

These measures will expectedly lead to an increase in the handling capacity of land corridors and in their reliability as well as to a reduction in cost and leading times and an increase in their reliability. Kazakhstan plays a very important role here, due to its extension and strategic position. Nevertheless, the implementation of such measures and recommendations must happen in a coordinated manner with the participation of all countries involved since, as landlocked countries, they are dependable on each other to develop their transport and logistics capacity, and thus, achieve socio-economic improvements.

3 Overview of the RETRACK – China connections

The RETRACK corridor, connecting the Benelux region on the Northwest side and Southeast Europe, runs over the TEN-T corridor number 4, connecting Rotterdam and Constanta.

The European Commission requested the RETRACK Consortium to investigate the possibilities of connecting the RETRACK Corridor to the Far East and specifically to China, given the substantial trade relations between China and Europe. For China and also for countries between China and Europe, such as Kazakhstan, land bridges by rail form an interesting alternative to the standard sea routes. Chapter 2 describes the selection of routes proposed to connect RETRACK and China via rail land bridges.

3.1 Selection of main rail land bridges connecting Europe and China

In the selection of the most optimal railway connections between RETRACK and China, the following key elements were taken into account:

– Part of existing and/or future trade lanes
– Connecting regions with existing and/or future substantial cargo volumes
– Part of (inter)national rail corridor development plans
– Providing existing and/or future competitive total transport time
– Providing existing and/or future competitive total transport costs

Various other key considerations have also been taken into account, specifically following the practical demand side orientation of RETRACK:

– Upcoming industrial activities in Western China provinces due to redeployment of production capacity from other provinces in China and supported by Chinese authorities
– Reinstatement of trading patterns, albeit with partly different types of commodities than in the past (pre 1990) between Eastern European countries, the Black Sea region countries, Caucasus and –Stan countries
– Increasing industrial and agricultural productivities resulting in availability of products for export from Central and Eastern Europe (e.g. cereals from Hungary, Croatia, Serbia and Romania, automotive parts and cars from Slovakia, Hungary, Romania), chemical products from the Netherlands and Germany towards Slovakia, Hungary and Romania but also in the opposite direction
– Development of near-shore activities in Central- and Southwestern Europe, predominantly, on the longer run, in Slovakia, Hungary, Serbia and in Romania, with increasing deliveries East of these countries and imports of raw materials and components from the East
– Increasing demand from industry for locations in intermodal freight villages
– Increasing volume originating in the Far East going via direct routes into Central and Eastern Europe

Additionally, various trade lanes are expected to see increasing volumes in the upcoming future. The main trade lanes of relevance for this project are:

- Iberian Peninsula to/from Ukraine – Russia/Central Asia - China
- Southern France & Italy to/from Ukraine – Russia/Central Asia - China
- Central Europe to/from Ukraine – Russia/Central Asia - China
- Southwestern Europe to/from Ukraine – Russia/Central Asia – China
- Europe to/from India

When taking the above mentioned arguments into consideration, two rail corridors already in existence and offering an opportunity of connecting RETRACK and China have been identified: the TransSib and TRACECA rail corridors. As the TransSib rail route from Duisburg, via Berlin, Moscow, Ulan-Ude, Zabaykalsk to Beijing in China is currently the only efficient rail alternative for the sea route in transport of the cargo from Europe to China, it was further selected as a reference route for reviewing the alternative routes and connections to the RETRACK corridor.

The connections from RETRACK need not only to be made to the existing areas which were "unlocked" by the TransSib and TRACECA corridors. Important areas in Ukraine, Southern Russia and Kazakhstan are not directly linked by either corridor. As there is a high potential that these areas will see increased activities in terms of trade with the countries "unlocked" by the RETRACK corridor, a third rail corridor, which runs through the territory of Kazakhstan, has been identified. As this corridor runs in-between the TransSib and the TRACECA corridors it is named the "CENTRAL Corridor".

Deliverable 13.2 therefore focuses on the analysis of three rail land bridges between RETRACK and China:

- Trans-Siberian rail corridor (referred further as TransSib corridor)
- TRACECA rail corridor (referred further as TRACECA corridor)
- Central - Kazakhstan rail corridor (referred further as Central corridor)

3.2 Connections of the RETRACK corridor with the TransSib, Central and TRACECA corridors

The RETRACK corridor, as defined in this project, runs from Rotterdam to Constanta. Northern Europe is connected with China through the already functioning and efficient TransSib rail corridor. Therefore, the connection of the Northern RETRACK with China is provided by the TransSiberian railway.

The further focus of this deliverable is in connecting the Southern part of RETRACK with three identified main rail corridors and further with China.

The forecast that an increasing volume originating in the Far East will be shipped to Central and Eastern Europe via direct routes is expected to generate significant shifts in today's transport situation. Today Central and Eastern Europe are consuming about 12% of Europe's GDP. However, only 1% of the products that come by sea are shipped directly into the region. The remainder goes predominantly via Northwestern Europe. About 70% of the cargo destined for this region, representing today's figures with a volume of about 4mln TEU, is originating in the Far East. This cargo can save considerable time in the supply chain (up to 5 days) by direct shipments to Central and Eastern Europe[34].

At the same time companies are redesigning their supply chains, in order to save time and costs. A key instrument is to split up the supply chain in two parts, the component part and the customisation part. The first has to take place in a high volume, low cost location. The second is to be positioned as near as possible to the sales market. The customisation is best carried out in a location with relatively high technical labour skills at the lowest possible cost. Within Europe the countries in the East are best positioned to execute these activities. Coupling the supply chain time, the increasing volumes for Central and Eastern Europe and the assembly (customisation) capabilities of the countries in especially Eastern Europe, results in a significant flow of components to arrive in the Eastern part of Europe for final assembly.

Other projects (such as projects executed by the "European Gateways Platform" www.europeangatewaysplatform.nl), show that Europe's environment can benefit significantly by supporting this partial redirection of trade flows into Europe. Such support is expected, given the European Union policies on environmental protection, the Trans-European Network, the Danube Strategy and the focus on the better utilisation of the seaports in Southern and Eastern Europe to alleviate the traffic burdens in other regions. Consequently, the trade flows in and through mainly the gateway ports such as Koper in Slovenia and Constanţa in Romania are expected to increase significantly. This means that more shipping lines will call these ports and this will lead to decreasing logistics costs to also serve other surrounding regions. Or in other words, this development will enhance the competitive position and thus volume on the trade lanes connecting Southern and Eastern Europe with more northern and eastern positioned markets such, as the Black Sea region, Russia and the Central Asian countries.

Recent years have also seen active development of the intermodal freight villages. As from the point of view of the RETRACK interest, one large intermodal freight village, including an airport, is now starting to be developed on the Western side of Bucharest with a size of 1,500ha (www.airport-ipm.com). Bratislava is also expected to see significant developments, e.g. through connecting rail and water solutions (e.g. rail shuttles from Hamburg and Rotterdam to Bratislava, continuation by inland water transport to e.g. Vidin and from there onwards by rail further into Bulgaria and Greece). Such developments improve the logistics efficiencies in these areas as well as the intermodal transport solutions and respond to the increasing demand from companies in the region (e.g. Samsung, Procter&Gamble, Tenaris, Ford, Metro, Lidl).

In total, the three hubs through which RETRACK can be connected to previously identified rail corridors, taking the above mentioned and the importance of the Middle and Eastern sections of the RETRACK corridor, the origins and destinations of the main

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[34] Port of Constanţa South Port Extension, April 2011, European Gateways Platform, Netherlands

trade lanes identified, the seaports and the production regions along the RETRACK corridor are:

- Bratislava
- Budapest
- Bucharest

From these three RETRACK hubs the markets and trade lanes along different rail routes need to be further connected with China.

The economic forecast, as well as the results of the interviews conducted within Deliverable 13.1 have illustrated that Western Chinese provinces are becoming more interesting from an economic perspective. South from Lanzhou a new very large chemical plant is under construction in Chongqing, which will start to produce in 2014. From there scheduled block trains are planned to Western Europe via Kazakhstan. In Urumqi a new container terminal is planned to serve as a hub for the region.

Therefore, the deliverable 13.2 focuses on connecting RETRACK to the Western Chinese provinces. In this respect, Lanzhou has been chosen as the market connecting point in China – being a central town in the Western Provinces of China and also a key hub for destinations further into China. We further refer to Lanzhou as the “destination” point of the assessed corridors.

From this starting point, three selected rail corridors were further analysed in the deliverable. For each of the rail corridors specific rail routes were identified and consequently assessed.

3.3 Identification of RETRACK – TransSib – China rail corridor and routes

Map 2: RETRACK – TransSib – China routes

3.3.1 Main routes and corresponding corridor organisation

There are three main rail routes which connect Western Europe with China using the TransSib railroad:

- Official TransSib route: Moscow – Yekaterinburg – Omsk – Irkutsk – Zabaykalsk (further reffered as TransSib – Manchurian route in this deliverable)
- Trans – Mongolian route[35]: Moscow – Yekaterinburg – Omsk – Irkutsk – Naushki – Ulan Bator (further reffered as TransSib – Mongolian route)
- Trans – Asian route: Moscow – Yekaterinburg – Petropavlovsk – Aktogay – Dostyk (further reffered as TransSib – Trans Kazakh route).

Moscow is the start/end point for all routes using the TransSib corridor. This means that Moscow (and, in this deliverable Moscow Becassovo in particular) is also the connecting hub from the RETRACK perspective.

[35] It is to be noted that the Trans Mongolian route currently is limited to a single track diesel line

Duisburg is the main connection option from the Northern part of RETRACK to TransSib. In the South, the connection options between the corridors are limited to two: Bratislava and Budapest. Cargo coming from farther East than 150 km East of Budapest is not expected to select a route via Budapest, but will seek alternative routing via the TRACECA or CENTRAL routes, if not via other modes of transport.

3.3.2 Interconnection option: RETRACK – Duisburg - TransSib

Routing: Duisburg (GER) – Hanover (GER) - Berlin Großbeeren (GER) – Frankfurt Oder (GER) – Kunovice (POL) – Warsaw (POL) – Malaszewicze (POL) – Brest (BEL) – Minsk (BEL) – Osinovka (BEL) – Krasnoe (RF) – Smolensk (RF) – Vyazma (RF) - Moscow Becassovo (RF)

This route is the traditional connection of the TransSib corridor and Western Europe. It passes through the territory of Germany, Poland, Belarus and Russia. The distance of the connecting route is some 2,363 km. It includes three border crossings, of which one within the European Union. The following table provides an overview on the different sections of the route by countries.

Table 10: RETRACK – TransSib connection via Germany, Poland and Belarus

Section of the route	Country/border crossings	Distance, km	Double track, km	Electrification, km
Duisburg - Frankfurt a/d Oder	Germany	580	580	580 with 15kV AC, 16 2/3 Hz
Frankfurt a/d Oder/Kunovice	Germany – Poland border	Operations performed: Border control and cargo clearance		
Kunovice - Malaszewice	Poland	681	676,5	681 with 3kV DC
Malaszewice /Brest	Poland – Belarus border	Operations performed: Gauge change, locomotive change, border crossing control[36], customs clearance, technical inspection		
Brest - Osinovka/Krasnoe	Belarus	608	608	608 with 25kV AC, 50Hz
Osinovka/Krasnoe	Belarus – Russia border	Operations performed: Locomotive change, border crossing control, customs clearance, technical inspection		
Krasnoe – Moscow	Russia	494	494	494 with 3kV DC; 25kV AC 50Hz
Total		**2,363**	**2,358,5**	**2,363 with 15kV AC, 16 2/3 Hz; 3kV DC; 25kV AC 50Hz**

Source: OSJD Rail transport corridor n 1, 2010; Belarussian Railways company brochure 2011; www.ecotransit.org 2011

[36] Border crossing control in this chapter is defined as all the relevant to the border crossing procedures except customs clearance and technical inspection

The railway infrastructure on the Duisburg – Moscow connection is in good condition. It is a double track (except some very small sections) and electrified both with 3kV and 25kV 50HZ systems. The loading gauge in the Polish territory is 0SM, 1 SM and 2 SM depending on the section and is T and 1 – T in Belarus and Russia respectively.

The EU internal border crossing and cargo clearances apply for the German – Polish border. At the Polish – Belarus border (Malaszewicze/Brest) the change of railway gauge takes place as well as traditional border crossing and customs control proceedings.

Belarus and the Russian Federation concluded a customs union and now apply the same technical and safety standards for rail operations, signalling and communication. Therefore, border procedures at the Belarus – Russian border are driven by technical and by staff management issues rather than by cargo clearance related topics.

Between numerous intermodal terminals and freight villages in Germany and Poland along the RETRACK – TransSib connection route, the most important terminals for RETRACK – China traffic are the terminals in Brest/Malaszewicze (operating at the interface of 2 railway line systems 1,435/1,520 mm), the intermodal terminals at Dortmund, Hanover and the freight villages Berlin South Großbeeren, Berlin West Wustermark in Germany and Poznan and Warsaw in Poland. The mentioned intermodal terminals allow for the handling of significant cargoes within the catchment areas of the terminal locations and for cross docking operations, due to the terminals being located at or close to North – South and East – West traffic junctions and are connected by ring – railroads or dense cargo rail networks, including shunting facilities.

The RETRACK – TransSib interconnection is served by numerous cargo trains serving the trade between the Netherlands, Belgium, Germany, Poland with the CIS countries. The most important “Moscovite” and “Ostwind” trains are described in Chapter 2. The link features train monitoring along the entire route, container handling at the departure and arrival terminals, pre-carriage and onward carriage service, and container provision. The combined CIM-SMGS consignment note is used for direct transport, ensuring quick customs clearance. Operators or railway container freight forwarders, such as Intercontainer, Transcontainer, Transsystem, ITM, Kombiverkehr, etc. organise significant train movements and cargo shipments via parts of the interlinking route within the EU Member Countries.

Below the main characteristics of these connection are summarised:

- Average transit time Duisburg – Moscow:

- Single wagon load train – 6 days
- Block train – 5 days

- Total distance: 2,363 km
- Number of border crossings: 3
- Rail gauge switch 1,435 to 1,520 mm: Malaszewicze/Brest

3.3.3 Interconnection option: RETRACK – Bratislava - Moscow - TransSib

Routing: Bratislava (SK) – Zilina (SK) – Kosice (SK) – Dobra (SK) – Chop (UKR) – Lviv (UKR) – Kiev (UKR) – Zernovo (UKR) – Suzemka (RF) – Kaluga (RF) – Moscow Becassovo (RF)

Table 11: RETRACK – TransSib connection via Slovakia, Ukraine and Russia

Section of the route	Country	Distance, km	Double track, km	Electrification, km
Bratislava – Dobra/Chop	Slovakia	540,4	536,4	540,4 with 3kV DC; 25kV AC 50 Hz
Dobra/Chop border crossing	Slovakia - Ukraine border,	6 km, double track, electrified Operations performed: Gauge change, locomotive change, border crossing control, customs clearance, technical inspection		
Chop - Zernovo/Suzemka	Ukraine	1,227	1,225	1,227 with 3kV DC; 25 kV AC 50 Hz
Zernovo/Suzemka	Ukrainian – Russian border	Operations performed: Customs clearance, locomotive change, border crossing control, technical inspection		
Suzemka – Moscow	Russia	488	488	488 km with 3kV DC; 25 kV AC 50 Hz
Total		**2,261,4**	**2,255,4**	**2,261,4 km with 3kV DC; 25kV AC 50 Hz**

Source: OSJD Rail transport corridor n 5, 2008

In terms of infrastructure, almost the entire route is double track with only two small sections representing a bottleneck. In all the countries different railway sections are electrified by either 3kV or 25 kV 50Hz systems.

On the Slovakia – Ukraine border crossing the following activities take place: change of gauge, locomotive change, technical inspection, customs clearance and other border control procedures.

The customs clearance for the import goods to Ukraine proceeds in Chop and for the export goods in Dobra.

The change of the railway gauge from 1,435 to 1,520 mm takes place at the Chop station in Ukraine. Chop is a large container terminal, where 20', 30' and 40' containers can be handled. In 2008 its working capacity was 8 containers per hour. The biggest problem with the railway gauge change at the Ukrainian borders is the availability of wagons.

A key connection and collection point on the route from Bratislava to Moscow is the Dobra terminal in Slovakia (located 10 km from the Ukrainian border). Since November 2008 this terminal, with an annual capacity of 250,000 TEU, is being leased for 15 years by TransContainer Slovakia (a subsidiary of Russian TransContainer). In 2009 the first container train from Korea was handled at this terminal. The terminal possesses the rail and size characteristics to grow into an efficient intermodal hub, especially as it has 4 wide - plus 4 narrow gauge tracks. Gauge change can take place here as well.

Customs clearance, locomotive change, technical inspection and other border control procedures take place at the Ukraine – Russia border crossing.

The unavailability of the railway wagons in Ukraine can be illustrated by the following: during the RETRACK field mission to Chop in 2011, 256 wagons on the European gauge section, as opposed to 1 wagon on the Russian gauge section was observed.

Another problem with the Ukrainian borders is a great number of approval documents which is requested by the authorities in order to execute border controls. Despite the fact that Ukraine is intensively introducing a one-stop-shop concept on its border crossings, the border crossing controls still result in the considerable delay of cargo.

In addition to the above mentioned Chop and Dobra terminals, other important container terminals situated on this interconnection are: Kiev-Liski in Ukraine and Moscow – Tovarnaia in Russia. Kiev-Liski has a daily capacity of 500 TEU/day and has the equipment to handle 20', 30' and 40' containers. Another container terminal in the Ukranian part of the route is Dnepropetrovsk – Liski. It has a capacity of 360 TEU/day but is only operating 20' TEUs.

The key characteristics of the Bratislava – Moscow connection are:

- Average transit time Bratislava – Moscow:

- Single wagon load train – 8 days[37]
- Block train - 3,5 days[38]

- Total distance: 2,261 km
- Number of border crossings: 2
- Rail gauge switch 1,435 to 1,520mm: Chop

[37] RETRACK inverviews, Yusen Logistics, January 2012

[38] Expert estimation based on: http://www.trcont.ru/?id=18&L=1 transit time Transcontainer block train "Czardas" running from Budapest to Moscow is 3,5 days. This indicates, given that Bratislava is closer to Moscow than Budapest, that a total transit time of 3,5 days should be possible for Bratislava to Moscow

3.3.4 Interconnection option: RETRACK – Budapest – Moscow - TransSib

Routing: Budapest (HU) – Debrecen (HU) – Zahon (HU) – Chop (UKR) – Lviv (UKR) - Kiev (UKR) – Zernovo (UKR) – Suzemka (RF) – Kaluga (RF) – Moscow (RF)

The connections from Budapest to Moscow differ from the previous connections along the first section and from Chop (Ukraine) they follow the same route.

Table 12: RETRACK – TransSib connection via Hungary, Ukraine and Russia

Section of the route	Country	Distance, km	Double track, km	Electrification
Budapest – Zahon/Chop	Hungary	708	653	708 with 25kV AC 50Hz
Zahon/Chop border crossing	Hungray - Ukraine border	Operations performed: Gauge change, locomotive change, border crossing control, customs clearance, technical inspection		
Chop - Zernovo/Suzemka	Ukraine	1,227	1,225	1,227 with 3kV DC; 25kV AC 50 Hz
Zernovo/Suzemka	Ukrainian – Russian border	Operations performed: Customs clearance, locomotive change, border crossing control, technical inspection		
Suzemka – Moscow	Russia	488	488	488 km with 3kV DC, 25kV AC 50 Hz
Total		**2,423**	**2,366**	**2,423 with 3kV DC; 25kV AC 50 Hz**

Source: OSJD Rail transport corridor n 5, 2008

At the Hungary – Ukraine border crossing Zahon/Chop, the following procedures take place: change of gauge, customs clearance, locomotive change, technical inspection and other border control procedures.

The inadequate amount of locomotives on the Hungarian railways is responsible for a major part of the delays at the Hungarian border stations. However, more and more multi-system locomotives are running (e.g. RCA) and also the diesel engines of the private undertakings such as GFR/Train Hungary via Curtici and Oradea. The lack of locomotives leaves terminals at the border crossings full of trains waiting to be hauled inland. This puts more demand on the capacity of these stations. In combination with the effect of trains hindered to enter the neighbouring country due to a similar situation, sometimes the terminals' capacity proves to be insufficient. The above mentioned can considerably increase the waiting time at the border crossing and, as reported by private operators, reforwarding at Zahon – Chop can take up to 2 days.

The change of gauge usually takes place in Chop. Zahon in Hungary is used only for the conventional goods. The Batove station, located near Chop, is used as the second Hungary - Ukraine border crossing station and in particular for liquid cargo and conventional cargo.

Customs clearance, locomotive change, technical inspection and other standard border control procedures take place at the Ukraine – Russia border crossing.

Important container terminals on this route are: Chop and Kiev-Liski in Ukraine and Moscow – Tovarnaia in Russia.

The key characteristics of this connection are:

- Average transit time Budapest - Moscow[39]:

- Single wagon load train – 8 days
- Block train - 3,5 days

- Total distance: 2,423 km
- Number of border crossings: 2
- Rail gauge switch 1,435 to 1520m: Chop

3.4 Identification of RETRACK – Central Kazakhstan - China rail corridor and routes

Map 3: RETRACK – Central Kazakhstan – China rail routes

39 RETRACK inverviewes, Yusen Logistics, January 2012 and consultant estimation

3.4.1 Main routes and corresponding corridor organisation

The existing railway infrastructure of Kazakhstan offers multiple opportunities to connect Europe and China by rail. They are discussed more in detail in Chapter 6. The Central corridor as proposed in this deliverable corresponds to the route described below.

Routing: Aksaralskaya II (RF) – Ganushkino (KAZ) – Makat (KAZ) – Kandagash (KAZ) – Shu (KAZ) – Almaty (KAZ) – Aktogay (KAZ) – Dostyk (KAZ)

This corridor runs only through the territory of Kazakhstan, with connections to RETRACK starting from the Aksaralskaya II border crossing station in Russia. The Aksaralskaya II/Ganushkino border crossing is selected as a connecting hub for RETRACK as it is not only an important rail hub but also an intersection point for the rail corridors of international importance. It connects both the East - West and North – South trade flows.

In addition to the already proposed RETRACK – Central corridor connections (through Budapest, Bratislava and Bucharest), an option for the future development is also noteworthy. This concerns the linkage of the RETRACK and Central corridors with a container feeder service between the Port of Constanţa in Romania and the Port of Kavkaz in Russia. A project is currently under appraisal by the Turkish rail company TCDD and the Russian State Railway to develop a ferry connection between the ports of Samsun in Turkey and Kavkaz in Russia. This project is supported by an agreement between the two Ministries of Transport and was concluded in May 2010. Given the size of the forecasted container developments in the Port of Constanţa (2008: 1,5mln TEU; 2011: approx 650,000TEU, forecast 2030: between 4 and 5,5mln TEU) and the logistics hub development of Romania, a linkage between the Port of Constanţa and the Port of Kavkaz could become viable. An alternative on the Russian side could be formed by the Port of Novorossiysk. However, this port is reported to have difficult hinterland rail connections from the port, due to the mountainous land configuration right behind the port and city. It will take at least another 10 years before this option can be considered as viable.

Currently, the Central corridor can be connected to RETRACK via three hubs which are described in the sections below. The existing connection possibilities for the three hubs are relatively similar and from Dnepropetrovsk they are identical. Bratislava and Budapest both connect via the transfer hub Chop where the gauge change is also made. The Bucharest connection is more complicated as it has to run through the Republic of Moldova and in particular, through Transnistria.

3.4.2 Interconnection option: RETRACK – Bratislava – Aksaralskaya II – Central corridor

Routing: Bratislava (SK) – Dobra (SK) – Chop (UKR) – Kirovograd (UKR) – Dnepropetrovsk (UKR) – Donetsk (UKR) – Krasnaya Mogila (UKR) – Gukovo (RF) – Volgograd (RF) – Trubnaya (RF) – Verkhnyi Baskunchak (RF) – Aksaralskaya II (RF)

Table 13: RETRACK – Central corridor connection via Slovakia, Ukraine and Russia

Section of the route	Country	Distance, km	Double track, km	Electrification
Bratislava – Dobra/Chop*	Slovakia	540,4	536,4	540,4 with 3kV DC; 25kV AC 50 Hz
Dobra/Chop border crossing	Slovakia - Ukraine border	Operations performed: Gauge change, locomotive change, border crossing control, customs clearance, technical inspection		
Chop - Krasnaya Mogila/Gukovo**	Ukraine	1,789	1,777	1,789 with 3kV DC; 25kV AC 50 Hz
Krasnaya Mogila/Gukovo border crossing	Ukranian – Russian border	12 km Last 30 km in front of border on Ukrainian side electrified with 3000V DC, single track Operations performed: Customs clearance, locomotive change, border crossing control, technical inspection		
Gukovo – Aksaralskaya II**	Russia	822	182	Not electrified
Total		**3,163,4**	**2,495,4**	**2,329,4 with 3kV DC; 25kV AC 50 Hz, 3000V DC not electrified**

*Source: * OSJD Rail transport corridor n 5, 2008; ** OSJD Rail transport corridor n 8, 2009*

In terms of infrastructure, the Russian section of the route forms the main bottleneck in this interconnection. From the 822 km, only 182 km are double track and the section is overall not electrified. There are two border crossings and the change of gauge takes place at the Slovakia – Ukraine border. The main terminals on the route are: Dobra and Chop. There are no relevant containter terminals along this route in Ukraine and Russia.

The key characteristics of this connection are:

- Average transit time Bratislava - Aksaralskaya II [40]:

- Single wagon load train - 10 days
- Block train – 7,5 days

[40] RETRACK interviews, Yusen Logistics, January 2012 and consultant estimation

- Total distance: 3,163,4 km
- Number of border crossings: 2
- Rail gauge switch 1,435 to 1,520: Chop

3.4.3 Interconnection option: RETRACK – Budapest – Aksaralskaya II – Central corridor

Routing: Budapest (HU) – Zahon (HU) – Chop (UKR) – Kirovograd (UKR) – Dnepropetrovsk (UKR) – Donetsk (UKR) – Krasnaya Mogila (UKR) – Gukovo (RF) – Volgograd (RF) – Trubnaya (RF) – Verkhnyi Baskunchak (RF) – Aksaralskaya II (RF)

Table 14: RETRACK – Central corridor connection via Hungary, Ukraine and Russia

Section of the route	Country	Distance, km	Double track, km	Electrification
Budapest – Zahon/Chop*	Hungary	708	653	708 with 25kV AC 50Hz
Zahon/Chop border crossing	Hungray - Ukraine border	Operations performed: Gauge change, locomotive change, border crossing control, customs clearance, technical inspection		
Chop - Krasnaya Mogila/Gukovo**	Ukraine	1,789	1,777	1,789 with 3kV DC; 25kV AC 50 Hz
Krasnaya Mogila/Gukovo border crossing	Ukranian – Russian border	12 km Last 30 km in front of border on Ukrainian side electrified with 3000V DC, single track Operations performed: Customs clearance, locomotive change, border crossing control, technical inspection		
Gukovo – Aksaralskaya II**	Russia	822	182	Not electrified
Total		**3,331**	**2,612**	**2,497 with 3kV DC; 25kV AC 50 Hz, 3000V DC, not electrified**

*Source: * OSJD Rail transport corridor n 5, 2008; ** OSJD Rail transport corridor n 8, 2009*

As mentioned in the previous case, the Russian section is the weakest section of this interconnection. There are two border crossings and at the Hungary – Ukraine border the change of gauge is performed. The main terminal along this route is Chop. There are no important container terminals in other countries in this direction.

The key characteristics of this connection are:

- Average transit time Budapest - Aksaralskaya II :

\- Single wagon load train - 10 days

- Block train – 7,5 days

- Total distance: 3,331 km
- Number of border crossings: 2
- Rail gauge switch 1,435 to 1,520: Chop

3.4.4 Interconnection option: RETRACK – Bucharest – Aksaralskaya II – Central corridor

Routing: Bucharest (RO) – Bacau (RO) – Yassi (RO) - Unghei (MOL) – Chisinau (MOL) – Tiraspol (MOL) – Kuchurgan (UKR) – Odessa (UKR) – Voznesensk (UKR) - Dnepropetrovsk (UKR) – Donetsk (UKR) – Krasnaya Mogila (UKR) – Gukovo (RF) – Volgograd (RF) – Trubnaya (RF) – Verkhnyi Baskunchak (RF) – Aksaralskaya II (RF)

Table 15: RETRACK – Central corridor connection via Romania, Moldova, Ukraine and Russia

Section of the route	Country	Distance, km	Double track, km	Electrification
Bucharest Triaz – Yassi/ Ungheni *	Romania	454	454	454 with 25kV AC 50Hz
Yassi/ Ungheni border crossing *	Romania – Moldova border	21 km, double track, not electrified Operations performed: Gauge change, locomotive change, border crossing control, customs clearance, technical inspection		
Ungheni – Novosavitskaya/Kuchurgan**	Moldova	211	66	Not electrified
Novosavitskaya/Kuchurgan ***	Moldova – Ukraine border corssing	Operations performed: Border control under control of Transnistrian separatist authorities, locomotive change, customs clearance, technical inspection		
Kuchurgan - Krasnaya Mogila/Gukovo***	Ukraine	1,250	1,140	Partially with 25kV AC 50Hz
Krasnaya Mogila/Gukovo border crossing ***	Ukranian – Russian border	Last 30 km in front of border on Ukrainian side electrified with 3000V DC, single track Operations performed: Customs clearance, locomotive change, border crossing control, technical inspection		
Gukovo – Aksaralskaya II****	Russia	822	182	Not electrified
Total		**2,758**	**1,863**	**454 with 3kV DC; 25kV AC 50 Hz; 3000V DC, not electrified**

*Source: * OSJD Rail transport corridor n 12, 2009; ** OSJD Rail transport corridor n 5, 2008;***www.bueker.net, **** OSJD Rail transport corridor n 8, 2009*

In terms of infrastructure, the Moldovan and Russian sections represent real bottlenecks, with both not being electrified and with only a small section being double track. The loading gauge on Moldovan section is C.

There are three border crossings on this interconnection where standard border control procedures take place as well as a change of locomotive and customs inspection. In addition, a change of gauge is performed at the Romanian – Moldovan border crossing.

A specific issue on this connection is formed by the Transnistria passage. Given its non-recognised status there are no (bilateral) agreements in place, nor is there a transparent and stable legal and procedural environment. This means that the local authorities can switch requirements and have trains delayed for whatever reason. In conclusion, in a current political set up, this passage causes many business risks.

There are several important container terminals on this route. First of all, Bucharest is an important container terminal location, with the Bucharest Noi terminal being a former main terminal with a daily capacity of 144 TEU/day. It operates 20' and 40' containers. Bucharest Sud is another former State terminal, now privately operated. A new, smaller terminal has recently been opened in Bucharest West, adjacent to a logistics park and is privately operated (www.tibbettlogistics.com). In Ploiesti, 60 km North of Bucharest another privately operated terminal has been opened amidst industrial parks (www.alinsoparks.com). Work will commence shortly on a large intermodal freight village including an international airport on the West side of Bucharest (www.airport-ipm.com).

In Moldova, the Ungheni border crossing station has a container terminal where 20' containers can be operated. The capacity of this terminal is 100 TEU/day. The Chisinau container terminal is also operating 20' containers and has a daily capacity of 200 TEU/day.

The key characteristics of this connection are:

- Average transit time Bucharest - Aksaralskaya II[41] :

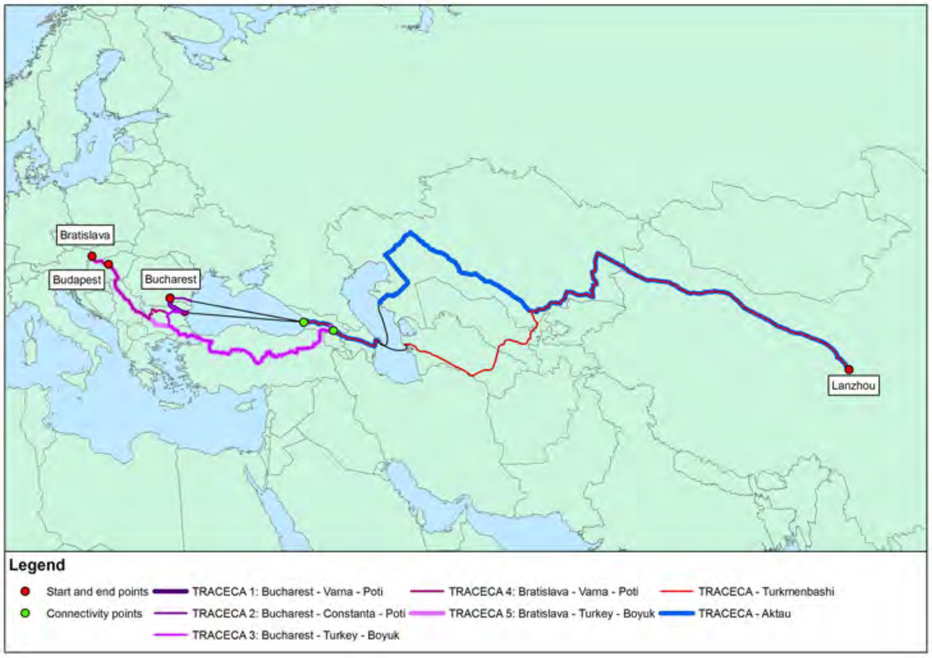
- Single wagon load tran - 15 days
- Block train - 12 days

- Total distance: 2,758 km
- Number of border crossings: 4 (Transinistria is also considered as a border crossing)
- Rail gauge switch 1,435 to 1,520: Yassi/ Ungheni

[41] Consultant estimation

3.5 Identification of RETRACK – TRACECA – China rail corridors and routes

Map 4: RETRACK – TRACECA – China routes



3.5.1 Main routes and corresponding corridor organisation

TRACECA stands for the Transport Corridor Europe Caucasus Asia. This intergovernmental initiative aims to develop economic relations, trade and transport communications in the regions of Europe, the Black Sea, the Caucasus, the Caspian Sea and Asia. It was officially launched in 1998 by the signature of the "Basic Multilateral Agreement on International Transport for Development of the Europe - the Caucasus - Asia Corridor". Currently the TRACECA route comprises a transport system of its 13 Member-States: Azerbaijan, Armenia, Georgia, Iran, Kazakhstan, Kyrgyzstan, Moldova, Romania, Tajikistan, Turkey, Ukraine and Uzbekistan.

The railway network of the TRACECA countries offers several combinations to connect the RETRACK corridor with China. When the railway connection between Armenia and Azerbaijan is closed due of political reasons, the TRACECA railway corridor through Turkey (Bulgaria – Turkey – Armenia – Azerbaijan and further) will no longer be feasible.

Therefore, two other alternative connections of RETRACK with Western China through the TRACECA routes are being investigated:

– TRACECA Turkmenbashi route: Poti – Tbilisi – Baku – Turkmenbashi – Ashgabat – Tashkent – Dostyk

– TRACECA Aktau route : Poti – Tbilisi – Baku – Aktau – Dostyk

Baku can be considered as the best connecting hub on the TRACECA Corridor, as every route, either via the Black Sea port Poti, or via a Turkish land line passes Baku. Furthermore, from the three RETRACK hubs, Bucharest and Budapest are the most relevant for this corridor. Bratislava is connected to the TRACECA corridor as it partially follows the main line of the RETRACK corridor (until Budapest). Therefore, the Bratislava – Budapest section in this case is still considered as part of the main RETRACK corridor.

Ongoing infrastructure and cooperation projects on the intersection of the TRACECA and RETRACK corridor areas make additional other connections potentially interesting for the future:

– The RETRACK corridor officially goes until Constanta in Romania. For the moment a ferry service between Constanta and Poti is inoperative, though discussions are currently being held to reinstate the service. The alternative connection is a rail ferry service connecting the Port of Varna in Bulgaria with the Port of Poti.
– The route via Turkey forms an alternative but is currently hampered by the rail track situation through Turkey. The tunnel under the Bosporus (Marmaray project: 77km of railway linking Europe with Asia is not ready yet), as well as several parts of rail need upgrading (e.g. between Ankara and Sivas) and the rail link between Kars in Turkey and Kartsakhi in Georgia needs to be constructed (total of 105km; the Turkish railway company TCDD is forecasting a total of 6,5mln tonnes of cargo to be transported as soon as this link is operational).The previously mentioned project to realise a tunnel under the Bosporus will shorten the transit time. Further rail works in the Eastern parts of Turkey are also necessary to make this route into a viable route. However, due to the possibility to connect this route with Middle Eastern countries it is considered to form an interesting alternative to the Black Sea route.

When taking into consideration above mentioned, the main connection hubs for the RETRACK – TRACECA corridors are for the time being Bucharest and Budapest. From these hubs, at present there is either the Black Sea route or the land route via Turkey to connect RETRACK to the TRACECA Corridor hub Baku.

3.5.2 Interconnection option: RETRACK – Bucharest – Varna – Poti - TRACECA

Routing: Bucharest (RO) – Giurgiu (RO) – Rousse (BG) – Varna (BG) – Poti (GEO)

The condition of the railway on this connection is poor. Romanian part is fully single track and not electrified.

There are two border crossings at this interconnection. Additionally, the gauge switch and wagon switch take place in Varna before the rail wagons enter the vessel. Export customs and border control takes place in Varna and import border control and customs takes place in Poti. The vessel does not sail directly from Varna to Poti, but has a stop at Illichievsk (alternatively Kerch, Ukraine). As a result, detailed checks are usually carried out because additional cargo could have been taken aboard.

Table 16: RETRACK – TRACECA connection via Romania and Bulgaria

Section of the route	Country	Distance, km	Double track, km	Electrification
Bucharest Triaz – Giurgiu/Rousse	Romania	61	0	Not electrified
Giurgiu/Rousse border crossing*	Romania - Bulgaria border	15km, single track, not electrified Resulting a new order by Romanian Prime Minister (as of 20 February 2012), at the moment all trains and trucks are checked for smuggling and non declared goods Operations performed: Customs clearance, locomotive change, border crossing control, technical inspection		
Rousse - Varna	Bulgaria	548,9	127,1	548,9 with 25kV AC 50HZ
Varna – Poti	Black sea ferry **	1,185	Operations performed: Gauge change, locomotive change, border crossing control, customs clearance, technical inspection	
Total		**1,809,9**	**127,1**	**548,9 with 25kV AC 50HZ**

*Source: OSJD Rail transport corridor n 12, 2009; *www.bueker.net;** Nautical maps*

The rail ferry line is currently testing the route Varna – Kavkaz – Poti. This is more preferable than Illichivsk and the expectation is that the line will decide on using Kavkaz. The reason for this is that this way the train does not have to pass the Ukraine. This is due to adverse experiences by Russian rail operators losing wagons in Ukraine and consequently they no longer want to position their wagons on trains passing the Ukraine. Furthermore, it saves an additional two border controls.

As described in the section above, there are several container terminals in Bucharest which operate both 20' and 40' containers. Rousse in Bulgaria is another important terminal. It is a big marshalling yard where container operations also take place.

The ferry terminal in Varna in Bulgaria is a highly functional terminal with ample capacity to handle all kinds of wagons and cargo. The vessels deployed are amongst the largest vessels, carrying up to 108 rail wagons.

The key characteristics of this connection are:

- Average transit time Bucharest - Poti[42] :

- Single load wagon load - 5 days
- Block train – 2 days

[42] Expert estimation, including the ferry sailing time 56 hours (UKRFerry Shipping Company)

- Total distance: 1,809,9 km, including 1,185 km by ferry
- Number of border crossings: 2
- Rail gauge switch 1,435 to 1,520: Varna

3.5.3 Interconnection option: RETRACK – Budapest (/Bratislava) - Sofia - Varna – Poti - TRACECA

Routing: Budapest (HU) – Kelebia (HU) – Subotica (SER) – Novi Sad (SER) – Jagodina (SER) – Dimitrovgrad (SER) – Dragoman (BU) – Sofia (BU) – Varna (BU) – Poti (GEO)

Table 17: RETRACK – TRACECA connection via Hungary, Serbia, Bulgaria

Section of the route	Country	Distance, km	Double track, km	Electrification
Budapest – Kelebia/Subotica	Hungary	166	2	25kV AC 50Hz
Kelebia/Subotica	Hungary – Serbia border crossing	Operations performed: Customs clearance, locomotive change, border crossing control, technical inspection		
Subotica – Dimitrovgrad/Dragoman*	Serbia	548	0	Non electrified between Nis and Dimitrovgrad – 104 km
Dimitrovgrad/Dragoman border crossing	Serbia – Bulgaria border crossing	Locomotive change, border crossing control, customs clearance, technical inspection		
Dragoman - Varna	Bulgaria	512	48,2	27,5 kV AC 50Hz
Varna – Poti	Black Sea ferry **	1,185	Operations performed: Gauge change, locomotive change, border crossing control, customs clearance, technical inspection	
Total		**2,311**	**50**	**25 kV AC 50HZ, 27,5 kV AC 50Hz**

*Source: OSJD Rail transport corridor n 6, 2010 ; * SEETO Comprehensive Network Development Plan 2012, December 2011; ** Nautical maps*

In terms of infrastructure, this interconnection option is almost all single track, with only small sections in Hungary and Bulgaria being double track. The Serbian section of the route only has 104 km of electrified track.

There are three border crossings on this connection, where all the standard border crossing actions are performed: customs clearance, locomotive change, technical inspection and other.

As described in the previous case, the gauge switch and wagon switch take place in Varna, before the rail wagons enter the vessel.

Noteworthy are the market reports on the border control on the Serbian – Hungarian and Serbian – Bulgarian borders. In case a Serbian private company is in charge of the formalities for a block train, the border control can be limited to hours. In case such company is not involved the border crossing time can go up to 1,5 days in total.

In addition to the terminals in the area of Budapest, which were described previously, Sofia in Bulgaria is a big marshalling station and a container terminal where 20' and 40' containers are operated. The Capacity of the terminal is 100 TEU/day. A new important terminal on this route is the Yana intermodal terminal just outside Sofia. This 35,000TEU/year capacity terminal is fully private owned and operated and plays an important role in the intermodalisation of transport in and through Bulgaria (www.ecologistics.bg).

The key characteristics of this connection are:

- Average transit time Budapest - Poti [43]:

- Single wagon load train – 9 days
- Block train - 6 days

- Total distance: 2,311 km, including 1,185 km by ferry
- Number of border crossings: 2
- Rail gauge switch 1,435 to 1,520: Varna

3.5.4 Interconnection option: RETRACK – Budapest (/Bratislava) –Sofia – Ankara – Tbilisi – TRACECA

Routing: : Budapest (HU) – Szeged (HU) – Subotica (SER) – Novi Sad (SER) – Jagodina (SER) – Dimitrovgrad (SER) – Dragoman (BU) – Sofia (BU) – Svilengrad (TUR) – Ankara (TUR) – Kars (TUR) – Tbilisi (GEO) – Boyuk Kasik (GEO)

The condition of the railway infrastructure on this connection is poor. Of the 3,392 km only 465 km are double track. It is a variation of electrified – not electrified sections with three different systems.

There are four borders to be crossed where all standard procedures take place: customs clearance, technical inspection, locomotive change and other procedures. In addition, the change of the railway gauge is performed.at the Turkey – Georgia border crossing.

The main container terminals on these routes are situated in Sofia, Belgrade and Istanbul - Halkali. Belgrade and Istanbul – Halkali are both important freight stations and are now being developed into modern intermodal transport oriented freight villages.

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[43] Consultant estimation

Table 18: RETRACK – Central corridor connection via Hungary, Serbia, Bulgaria and Turkey

Section of the route	Country	Distance, km	Double track, km	Electrification
Budapest – Kelebia/Subotica	Hungary	166	2	25kV AC 50Hz
Kelebia/Subotica	Hungary – Serbia border crossing	Operations performed: Customs clearance, locomotive change, border crossing control, technical inspection		
Subotica – Dimitrovgrad/Dragoman	Serbia	548	0	Non electrified between Nis and Dimitrovgrad – 104 km
Dimitrovgrad/Dragoman border crossing	Serbia – Bulgaria border crossing	Operations performed: Customs clearance, locomotive change, border crossing control, technical inspection		
Dragoman – Svilengrad/ Kapikule	Bulgaria	372	160	Not electrified, 27,5kV AC 50Hz
Kapikule/ Edirne border crossing	Bulgaria – Turkey border crossing	Operations performed: Customs clearance, locomotive change, border crossing control, technical inspection		
Kapikule – Ankara	Turkey	866	218	Not electrified, 3kV
Ankara - Kars	Turkey	1,050	10	60 km, 25KV 50Hz
Kars/Kartsakhi border crossing	Turkey – Georgia border crossing	Operations performed: Rail gauge change, customs clearance, locomotive change, border crossing control, technical inspection		
Kartsakhi – Gardabani/Boyuk Kasik	Georgia	390	75	Electrified, 3kV DC
Total		**3,392**	**465**	**25 kV AC 50Hz; 27,5 kV AC 50Hz; 3000V DC; non-electrified**

Source: OSJD Rail transport corridor n 6， 2010; www.bueker.net

The key characteristics of this connection are:

- Average transit time Budapest – Boyuk Kasik[44] :

- Single wagon load train - 15 days
- Block train - 10 days

[44] Expert estimation based on www.marslogistics.com. Block train run from Hungary to Halkali terminal in Istanbul is 6 days; from Slovakia to Halkali – 7 days; and further 3 days to Iraq. Note: single wagons trains are about 6 days longer.

- Total distance: 3,392 km
- Number of border crossings: 4
- Rail gauge switch 1,435 to 1,520: Kartsakhi

3.6 Final destinations within China

The sections below provide a short summary of the distances and conditions of the railways for the final destinations in China. As discussed previously, Zabaykalsk – Beijin is taken as a reference case. For all other routes the destination in China is Lanzhou.

The loading gauge on the Chinese railways is 4,800 mm. The maximum freight train length is 1,000 m. The Chinese railways do not provide at all the users with information about their container location while crossing China (MoS Market view).

The average transit time for the single wagon load was identified during the RETRACK interviews in January 2012 with Yusen Logistics and IRS. The average transit time for the block train runs is a consultant estimation.

3.6.1 Destination: Zabaykalsk - Beijing

Routing: Zabaykalsk (RF)/Manzhouli(PRC) – Qiqihar (PRC) – Harbin (PRC) – Changchun (PRC) – Shenyang (PRC) – Quinhuangdao (PRC) – Beijing (PRC)

Table 19: Destination: Zabaykalsk – Beijing

Sections of the route	Country	Distance, km
Russia – China border crossing Zabaykalsk/ Manzhouli	Operations performed: change of gauge, border control, locomotive change, customs clearance, technical inspection	
Zabaykalsk - Manzhouli	Russia - China	12
Manzhouli – Beijing	China	2,313
Total		**2,325**

Source: OSJD Rail transport corridor n 1, 2010

The Chinese section Manzhouli – Harbin is not electrified the section Manzhouli – Hailar is single track and the section Hailar – Harbin is double track. The section going further from Harbin to Beijing is double track and electrified. In total, 935 km are double track and 1,396 km are electrified on the section Manzhouli – Beijing.

Zabaykalsk terminal and railway station is described more in detail in Chapter 5 of this deliverable.

The key characteristics of this connection are:

- Average transit time Zabaykalsk – Beijing:

- Single wagon load train - 6 days
- Block train - 4 days

- Total distance: 2,325 km
- Number of border crossings: 1
- Rail gauge switch from 1,520 to 1,435 mm: Zabaykalsk/ Manzhouli

3.6.2 Destination: Zabaykalsk – Lanzhou

Routing: Zabaykalsk (RF)/Manzhouli(PRC) – Qiqihar (PRC) – Harbin (PRC) – Changchun (PRC) – Shenyang (PRC) – Quinhuangdao (PRC) – Beijing (PRC)- Shijihazuang (PRC) – Zhengzhou (PRC) – Xi'an (PRC) – Lanzhou (PRC)

Table 20: Destination: Zabaykalsk– Lanzhou

Sections of the route	Country	Distance, km
Russia – China border crossing Zabaykalsk / Manzhouli	Operations performed: change of gauge, border control, locomotive change, customs clearance, technical inspection	
Zabaykalsk - Manzhhouli	Russia - China	12
Manzhouli – Lanzhou	China	4,021
Total		**4,033**

Source: RETRACK interviews, Yusen Logistics, January 2012

The routing within the PRC between Beijing and Lanzhou via the Longhai Line and the Main Line network in Central China consists of double track and widely electrified railway lines. An alternative connection with Beijing and Lanzhou is via Jining Nan and inner Mongolia. However, the technical capabilities of the latter is characterised by single track, non electrified railway alignments. In total, 3,579 km of the Zabaykalsk – Lanzhou route are double track and at least 3,042 are electrified.

The key characteristics of this connection are:

- Average transit time Zabaykalsk – Lanzhou[45]:

- Single wagon load train - 12 days
- Block train - 10 days

[45] RETRACK interviews, Yusen Logistics, January 2011 and consultant estimation

- Total distance: 4,033 km
- Number of border crossings: 1
- Rail gauge switch from 1,520 to 1,435 mm: Zabaykalsk/Manzhouli

3.6.3 Destination : Dostyk– Lanzhou

Routing: Dostyk (KAZ)/ Alashankou (PRC) – Urumqi (PRC) – Lanzhou (PRC)

Table 21: Destination: Dostyk – Lanzhou

Sections of the route	**Country**	**Distance, km**
Kazkakhstan – China order crossing Dostyk/ Alashankou	Operations performed: change of gauge, border control, locomotive change, customs clearance, technical inspection	
Dostyk/Chineese border - Alashankou	China	8,5
Alashankou - Lanzhou	China	2,393,8
Total		**2,402,3**

Source: OSJD Rail transport corridor n 2, 2009

Of the 2,402,3 km of the Chinese section of the route, 1,676 are double track and only 295 km are electrified. The change of gauge, locomotive change, technical inspection and other border control procedures take place oat the Dostyk/Alshankou border crossing.

Operational and technical problems related to the Dostyk/Alashankou border crossing are described more in detail in the deliverable 13.1 and in Chapter 7 of the current deliverable.

On this section of the route two important container terminals are situated: Urumqi and Lanzhou. Both terminals are able to operate 20' and 40' TEU containers and also provide intermodal rail-road transport services.

Urumqi terminal has a capacity to operate 1,300 TEU/day and a capacity to store 60 TEU containers. Lanzhou terminal's operation capacity is 1,600 TEU/day with a storage capacity of 60 TEU containers.

The key characteristics of this connection are:

- Average transit time Dostyk - Lanzhou[46] :

- Single wagon load train - 11 days

[46] RETRACK interviews, Yusen Logistics, January 2011 and consultant estimation

- Block train - 5

- Total distance: 2,402,3 km
- Number of border crossings: 1
- Rail gauge switch from 1,520 to 1,435 mm: Dostyk/Alashankou

3.6.4 Destination: Zamin Uud – Lanzhou

Routing: Zamyn-Uud (MON)/Erenhot (PRC) – Datong (PRC) – Beijing (PRC) – Shijihazuang (PRC) – Zhengzhou (PRC) – Xi'an (PRC) – Lanzhou (PRC)

Table 22: Destination: Zamyn Uud – Lanzhou

Sections of the route	Country	Distance, km
Mongolia – China border crossing Zamyn-Uud / Erenhot	Operations performed: change of gauge, border control, locomotive change, customs clearance, technical inspection	
Zamyn – Uud - Erenhot	Mongolia - China	8
Erenhot – Beijin	China	834
Beijin - Lanzhou	China	1,803
Total		**2,645**

Source: RETRACK interviews, Yusen Logistics, January 2012

The railway line between Erenhot – Beijing is double track[47]. The railroad from the Chinese border station Erenhot to Jining is a single track and then a double track to Beijing. As described before, the routing between Beijing and Lanzhou via the Longhai Line and the Main Line network in Central China consists of double track and widely electrified railway lines. It is reported that because of the single track line in Mongolia the capacity for international freight trains is only 8 per day and per direction[48]. In total, 1,781 km of this connection is double track lines. At least 1,857 km are electrified.

The key characteristics of this connection are:

- Average transit time Zamyn Uud – Lanzhou[49]:

- Single wagon load train - 12 days
- Block train - 7 days

- Total distance: 2,645 km

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47 OSJD n 1

48 ICOMOD study, July 2011

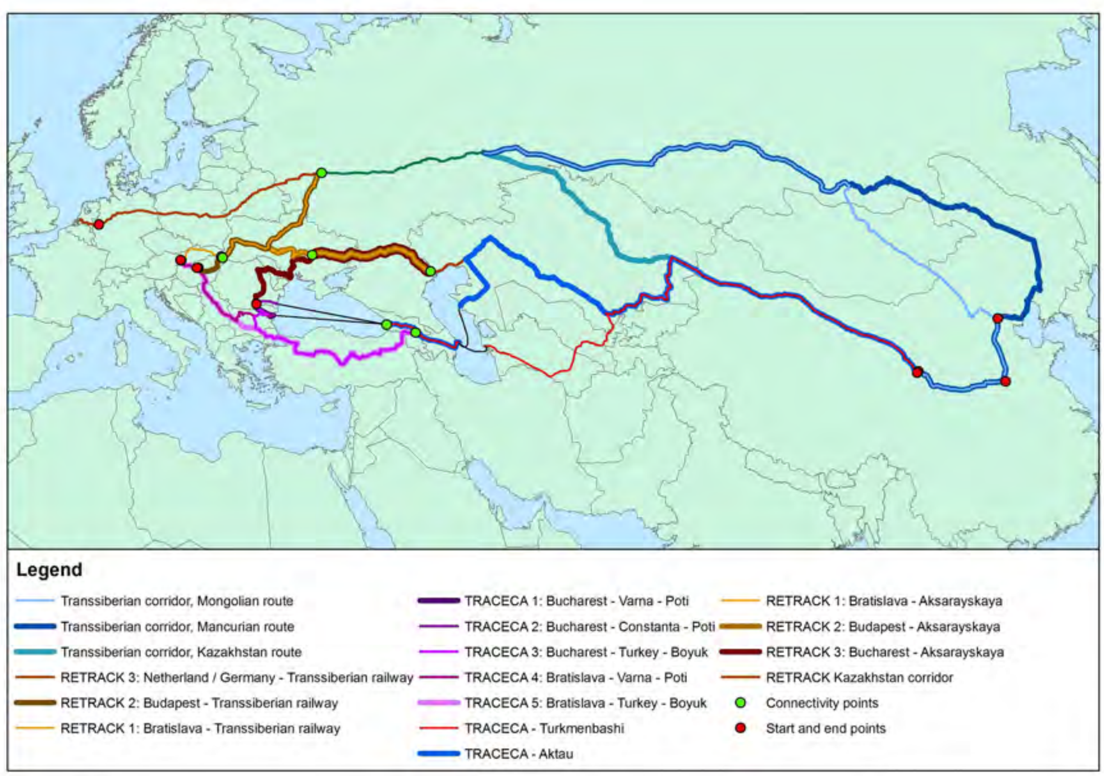
49 RETRACK interviews, Yusen Logistics, January 2011 and consultant estimation

- Number of border crossings: 1
- Rail gauge switch from 1,520 to 1,435 mm: Zamyn Uud/ Erenhot

3.7 Summary of the RETRACK – China rail corridors and interconnection routes

In this chapter, three main rail land bridges connecting Europe and China have been defined. For each of these corridors concrete rail routes were further determined. Corridors and routes are illustrated on map 5.

Map 5: Connection of Europe and China through the railbridges



TransSib corridor:

– TransSib – Kazakh route
– TransSib – Mongolian route
– TransSib – Manchurian route

Central corridor:

- Aksaralskaya II – Dostyk route

TRACECA corridor:

– TRACECA – Turkmenbashi route
– TRACECA – Aktau route

These rail corridors and routes will be further analysed and assessed in the following chapters. For each of the corridors, connection points with the RETRACK corridor were identified: Budapest, Bucharest and Bratislava. Duisburg is an origin point for the official TransSib route, which is also a reference case for this report. The most relevant interconnections were further assessed for each of the corridors. Table 23 summarises the main results for each of the corridors.

Table 23: Comparison of interconnection possibilities for RETRACK – TransSib corridor

Interconnection	**Distance, km**	**Double track, km**	**Electrification systems**	**Border crossings**	**Average transit time, days**	
					Single wagon load	Block train
Duisburg - Moscow	2,363	2,363	2,363 with 3kV DC, 25kV AC 50Hz	3	6	5
Bratislava - Moscow	2,261	2,257	2,261,4 with 3kV DC, 25kV AC 50Hz	2	8	3,5
Budapest - Moscow	2,423	2,366	2.423 with 3kV DC, 25kV AC 50Hz	2	8	3,5

The change of the railway gauge, both for the Bratislava and Budapest connections, takes place at Chop. The availability of wagons at Chop is one of the greatest bottlenecks for both interconnections. The administrative procedures on the Ukrainian side are another problem area.

As the average travelling time, distance and infrastructure condition are quite similar for both of the interconnections, Bratislava and Budapest will compete in the future to be the main RETRACK connection point with the TransSib railway.

Interconnection options for the Central corridor are presented in the Table 24. In terms of infrastructure, the Russian section of the railway forms the main bottleneck for all of the interconnections, as it is mostly single track and not electrified.

Even though the route from Bucharest is the shortest in terms of distance, it it has two additional borders and therefore, implies many more delays. Moreover, it crosses the politically instable Transnistria territory in Moldova, which represents an additional risk factor for the connection. Therefore, again Bratislava and Budapest are considered as the most efficient and competing hubs for at least the short and medium term.

Table 24: Comparison of interconnection possibilities for RETRACK – Central corridor

Interconnection	Distance, km	Double track, km	Electrification systems	Border crossings	Average travelling time, days	
					Single wagon load	Block train
Bratislava – Aksaralskaya II	3,163,4	2,495,4	2,329,4 with 3kV DC, 25kV AC 50Hz, not electrified	2	10	7.5
Budapest – Aksaralskaya II	3,331	2,612	2,497 with 3kV DC, 25kV AC 50Hz, not electrified	2	10	7.5
Bucharest – Aksaralskaya II	2,758	1,863	454 with 3kV DC; 25kV AC 50 Hz, not electrified	4	15	12

In the case of the RETRACK – TRACECA corridor, the main interconnection points studied were Bucharest and Budapest. Bratislava is connected to the TRACECA corridor through Budapest, therefore, the section Bratislava – Budapest is considered to be part of the RETRACK corridor.

Table 25: Comparison of interconnection possibilities for RETRACK – TRACECA corridor

Interconnection	Distance, km	Double track, km	Electrification systems	Border crossings	Average travelling time, days	
					Single wagon load	Block train
Bucharest – Poti	1,809,9	127,1	25kV AC 50Hz	2	5	2
Budapest – Poti	2,311	50	25kV AC 50Hz; 27,5kV AC 50Hz	3	9	6
Budapest – Boyuk Kasik	3,392	465	25 kV AC 50Hz; 27,5 kV AC 50Hz; 3,000V DC; non-electrified	5	15	10

The interconnection route through Bucharest is considered to be the best option for the RETRACK – TRACECA connection, as it is the shortest and less time consuming route. The route through Budapest includes Serbian territory which increases not only the travelling time, but also the time spent at borders. The Budapest – Bouyk Kasik interconnection is the longest, however, it provides a possible land solution alternative in the case where ferry transport is not unavailable.

The main focus of the current deliverable is on the provision of the railway solutions between Europe with Western China. Therefore, two destination points were selected in

China: Beijing as a destination point for the reference case and Lanzhou as a destination point for all other routes.

It should be taken into consideration that the market will force the suppliers of rail services to cluster the cargo on only one hub for the total region of Slovakia, Austria and Hungary. The relevant industrial base (e.g. automotive) around Bratislava, as well as the growth opportunity in this region is the highest from the previously mentioned market regions. Furthermore, it is well positioned to use its position on the Danube (and contrary to Vienna it has large development space available) to provide logistics operators all modes of transport in an efficient manner. Consequently, Bratislava could become the market choice for bundling and concentrating the intermodal transports. Despite the connection via Bratislava, between Italy and Russia, being longer than via Budapest, the higher cargo bundling opportunities in Bratislava and the resulting lower costs could very well lead to Bratislava being favoured as the cargo hub on the o/d Central Europe – Russia & Far East.

4 Railway infrastructure and institutional framework in the countries involved in the TransSib, Central and TRACECA corridors

Chapter 4 summarises the railway infrastructure characteristics, the rolling stock condition and the institutional set-up of railway transport in the countries of the three main corridors. The features that are specific to each of the corridors are described in further detail in chapters 5, 6 and 7 respectively.

4.1 Railway infrastructure and rolling stock characteristics

Azerbaijan

The Azerbaijan railway network is 2,122 km in length, of which 805 km are double track and 1,278 km are electrified. The electrification system in Azerbaijan is 3kV DC.

Two main railway lines run from the Georgian border and from the Armenian border to Baku. As indicated in the MoS railway report, “much of the Azerbaijani network has suffered from deferred investment. The railway is over 30 years old and around 40% of the track length needs to be rehabilitated”. The poor condition of the railway causes derailments and restricts the train speed on certain sections up to 30 km/h. In general, the maximum speed for freight trains is limited to 80km/h.

1,512 km of the Azerbaijani railway are equipped with the full automatic block signaling, the rest is equipped with semi-automatic block control by a centralised dispatcher with no intermediate signaling between passing loops[50].

The Azerbaijani State Railway (ADDY) is the only main line rail operator in Azerbaijan. It is 100% state – owned and operates under the direction of the Ministry of Transport. ADDY owns 204 two-section electric locomotives, of which 96 are in active use[51]. The locomotive fleet is technically obsolete: some of the 46 locomotives are less than 15 years old, while the rest are over 35 years old (VL-8 locomotives). As the MoS country report indicates, these VL-8 locomotives are beyond their design life and are experiencing a high level of failures: roughly one failure per locomotive per month. The usage of the old locomotives considerably increases the transit time on the railways: locomotives need to be changed regularly in order to lower the engine temperature. Moreover, often they can not operate far from the assigned repair base. Specific crew are appointed for operating a given locomotive so it can be easily rigged back to the shop in case of any failures.

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50 Motorways of the Sea for the Black Sea and the Caspian Sea. Country profile Azerbaijan, July 2010

51 Idem

Due to the obsolete condition of the railway infrastructure and rolling stock, the maximum weight of the trains is reduced to 2,800 t. The maximum axel load on the TRACECA section is 23 t[52].

The ADDY has around 23,500 wagons of which 7,771 are in the working fleet, 10,162 are spares and 5,655 wagons that could be rehabilitated if required[53]. However, the company anticipates shortages of semi-wagons and tank wagons. Old and dilapidated equipment is used for handling intermodal shipments. 3 and 5 tonne rail containers are still in circulation.

Azerbaijani Railway has begun the process of modernisation and rehabilitation of the railway infrastructure as stated in the framework of the State Development Programme. By the year 2014, it is planning to rehabilitate rolling stock and increase its railcar fleet by purchasing 50 new alternating current type electric locomotives and 4,000 new railcars, out of which at least 2,000 will be tank cars. Within the ongoing Railway Trade and Transport Facilitation Project (financed by the World Bank and the Azerbaijani Government) the rehabilitation of the Baku - Georgian border railway section and the procurement of the new electric tools is being executed. The electrification system will be converted from current the 3,3kV DC to 25kV AC 50 Hertz Alternating.

Georgia

The total length of the Georgian railway network is about 2,344.2 km, of which the length of the main lines are 1,619.7 km. Only 293,3 km are double track lines. Two main railway lines connect the Georgian Black Sea ports with the Azerbaijan border and Tbilisi with the Armenian border. About 80% of the network runs through mountainous terrain, over 1,422 bridges and through 32 tunnels. On the main sections the stations are equipped with the electric centralisation system. The secondary sections are equipped with automatic blockage systems (82.5 km[54]) and semi – automatic blockage systems (1,239 km)[55]. 1,251 km of the network are electrified with the system of 3kV DC.

Georgian Railways LLC (GR LLC) is a sole rail operator and rail infrastructure owner in Georgia and is a 100% state-owned company. GR LLC has 308 locomotives, of which 174 are electric and 134 are diesel. In addition, it has 11,711 freight cars, of which 1,205 are platforms and 50 are container cars[56]. Many of these locomotives and wagons are in obsolete condition and their operation is time-consuming (e.g. regular change of locomotives and wagons is required; speed limit of the trains is reduced). The maximum train mass allowed on the Georgian railways varies from 2,800 to 3,000 t.

Georgian Railway is currently working on a “Fast Railway” project which aims to considerably increase the speed and throughput volume capacity of the network.

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52 Motorways of the Sea for the Black Sea and the Caspian Sea, Azerbaijan, Georgia, Kazakhstan, Turkmenistan and Ukraine- Railways report, July 2010

53 Motorways of the Sea for the Black Sea and the Caspian Sea. Country profile Azerbaijan, July 2010

54 Kaspi – Gori tonal system and Tbilisi – Kaspi code system

55 www.railway.ge

56 www.railway.ge

It implies modernisation of Georgian Railway's central mainline and the creation of a new straight mainline on the Rikoti pass.

Kazakhstan

The total length of the Kazakhstan railways is 13,600 km, of which about 4,800 km are double track and about 5,000 km are electrified. The electrification systems used in Kazakhstan are 25kV AC and 3kV DC. There are about 10,000 km of sections with automatic train signal systems and also a lot of signalling equipment and train passing siding facilities for signle track sections.

Due to the historical background the railway network of Kazakhstan has been more developed towards Russia, providing several cross-border connections. The three main Kazakh railway lines are: the Trans-Kazakhstan railway from Petropavlovsk to Karaganda coalfield, the Turkestan – Siberian route from Semipalatinsk to the Kyrgyzstan and the Uzbekistan borders and the railway line linking Tashkent in Uzbekistan with Orenburg in the Russian Federation.

The railway infrastructure maintenance is a pressing issue in Kazakhstan. Low national investments in the railway sector result in a constantly reduced number of railway lines being modernised or rehabilitated. The latter influences the condition of the railway system and has a direct impact on the costs, lead times and safety of transport. Nevertheless, depending on the line section, the maximum operating speed on the Kazakhstan railways is reported to be 60 – 80 km/h. The JICA study reports (p 3 -15) that the average speed of a freight train in 2005 was 40,9 km/h.

The Ministry of Transport and Communication of Kazakhstan has the overall responsibility of the rail sector. The National Joint Stock Company “Kazahstan Temir Zholy” (KTZ) is in charge of the management and maintenance of the Kazakh railways, as well as the operations of passenger and freight services. The ownership of the railway infrastructure and rolling stock remains with the state.

The condition of the rolling stock in Kazakhstan is poor. Because of the ageing of the rolling stock and the fact that its not appropriately renewed, the total number of locomotives in Kazakhstan reduces annually: in 2000 the inventory showed 1,963 vehicles, in 2010 it was 1,681[57]. Two thirds of the locomotives are diesel-electric and the maintenance of these locomotives is the responsibility of JSC “Locomotive”.

In 2010 the working fleet of wagons in Kazakhstan was around 96,409, of which 43,305 were private-owned[58]. KTZ owns around 1,000 container wagons, but they are always in short supply. This is despite the fact that additionally around 1,000 foreign container wagons are circulating on Kazakh territory. KTZ owns approximately 8,600 containers, of which 6,200 are small size containers of 3t and 5t. The JICA study (p. 7-13) estimated that in 2017 the required number of container wagons will be 9,150.

57 Agency of Statistics of the Republic of Kazakhstan, Statistical Yearbook “Kazakhstan in 2010”, Astana, 2010

58 Idem

The current railway container freight handling is carried out through 11 main stations which are not enough to support the transport network of 14,000 km (JICA 7 – 10). Freight forwarders also report a shortage of the container platforms in Kazakhstan and the majority of the existing platforms are built for 40 feet containers and there are almost no cargo platforms for 20 feet containers.

Mongolia

The Mongolian rail network comprises 1,815 km of broad gauge track. The section of the Mongolian railway that is relevant to RETRACK is the Transmongolian line, running from north to south. It is the main railway line in Mongolia and is 1,110 km long. It has seven small branches to mineral deposits: Erdenet (164 km), Sharyngol (63 km), Nalaikh (13,7 km) and Baganuur (94 km), Bor-Öndör (60 km) and Züünbayan (50 km). The Choibalsan-Erenzav line is a second separate railway line in the east of the country, which also links Mongolia with Russia (268 km). Due to historical reasons Mongolia and Russia have common technical railway standards and gauge.

At present the Mongolian rail network is managed by Infrastructure Development Ltd., a company owned jointly by Russian Railways JSC (50%), the state mineral company Erdenes MGL (25%) and the Mongolian railway company (25%).[59] Infrastructure Development Ltd is responsible for the operation and development of the Mongolian railway network. The condition of the rail infrastructure in Mongolia is poor.

The only railway company in Mongolia is Russian-Mongolian Joint Stock Company Ulaanbaatar Railway (UBTZ). It operates 59 locomotives, 2,569 freight cars and 261 passenger wagons.[60] Operated infrastructure and rolling stock is mostly for Russian production. The rolling stock is characterised by a high degree of wearing: 85% of the locomotives are 25 years old and 75% are more than 35 years old. Signalling and communication systems are outdated and there is a general lack of capacity design (the length of sections with rails on wooden sleepers is about 80%).

In 2009 a new development concept for UBTZ was developed and Infrastructure Development Ltd is currently building a new rail infrastructure in Mongolia. The estimated investment volume up until 2015 is 3,9 billion USD, of which 2 billion USD is for the modernisation of the existing railway network and 1,9 million USD is for the building of a new railway line Tavantalgoj – Saishand (507 km), linking the Transmongolian line with the coal deposit Tavantalgoj.

Russian Federation

The rail infrastructure network in the Russian Federation comprises more than 85,281 km, of which 99% belongs to Russian Railways JSCo (RZD). The remaining network belongs to the major ports and industrial combines. 43,100 km of the Russian network are electrified with electrification systems 25kV AC and 3kV DC.

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59 http://inter.rzd.ru/isvp/public/

60 http://www.legendtour.ru/rus/mongolia/informations/ubzd.shtml

RZD is a 100% state-owned company founded in 2003 after the structural reform of the Russian state railways. The Russian Federation is the only shareholder of the Company and delegates shareholder control to the Government. The RZD is in charge of freight and passenger transport in the RF, infrastructure provision and development, locomotive propulsion services, repair and maintenance of rolling stock, building railway infrastructure and engineering.

RZD operates 29,227 locomotives, of which 7,535 are electric locomotives for cargo trains, 3,656 are freight diesel – electric locomotives, 6,016 are diesel driven shunting locomotives and 3,020 electric or diesel engines are designated for passenger trains. Recently RZD acquired 393 new locomotives (of which: 150 freight electric locomotives, 28 freight diesel locomotives, 94 diesel-locomotive shunters) within the framework of the Investment Programme 2010.

The freight car fleet, registered in the Russian Federation, comprises approximately 1,025,000 freight cars. In December 2010, 50,5% were within the inventory stock of RZD, its subsidiaries and affiliates and 49,5% of the wagons were the property of independent private owners[61].

In general, RZD is challenged by rapidly aging rolling stock. Based on the most recent inventory data, in 2009-2012 the company will have to decommission over 25% of its rolling stock (615,000 rail cars, all types) due to poor technical condition. Around 65-80 billion RUB will need to be invested (the equivalent of around 1,5 -1,9 billion euro)[62] to maintain the remaining cars. [63]

The part of the Russian railway network that is relevant to RETRACK is the TransSib Railway (TransSib), which is a backbone of the Russian railways. TransSib stands for the network of railways connecting Moscow with Vladivostok via Yekaterinburg, Omsk, Novosibirsk, Irkutsk, Ulan-Ude, Chita and Khabarovsk. The route is about 10,000 km long and is operated by 9 rail territorial branches of RZD (of the total 17): Moscow Railway (Moscow), Gorky Railway (Nizhnij Novgorod), Sverdlovsk Railway (Yekaterinburg), South Urals Railway (Chelyabinsk), West Siberian Railway (Novosibirsk), Krasnoyarsk Railway (Krasnoyarsk), East Siberian Railway (Irkutsk), Zabaikal Railway (Chita), Far Eastern Railway (Khabarovsk)[64]. TransSib has branch lines to Mongolia and China in the east through frontier stations Naushki, Zabaykalsk, Grodekovo, Hasan and to Kazakhstan in the southern Ural region though the frontier station Petropavlovsk.

The TransSib network is a double track and is fully electrified on the entire main route (at 25kv AC or 3 kv DC). There are a few one-way segments on it's branch lines[65] that are not electrified and there are 36 stations located along the TransSib that are specially

[61] Annual Report JSC Russian Railways, 2010

[62] Exchange rate on 09.11.11: 1 RUB=0.02383 EUR, currency converter http://www.oanda.com

[63] Annual Report JSC Russian Railways, 2010

[64] Headquarters of the railways specified in brackets

[65] See Chapter 5 for the more detailed information

equipped for handling containers. This includes 13 terminals for the handling of 40ft containers.[66]

Turkmenistan

The railway network of Turkmenistan comprises almost 3,000 km of lines, which are all single track and are not electrified. Currently there are three main rail routes: TRACECA route (Turkmenbashi port – Ashgabat – Uzbekistan border), the railway line from Mary to Serhedabad and the railway line along the Uzbekistan border.

The Turkmen Ministry of Railway Transport owns, operates and regulates the railway network and therefore is responsible for all investment in the infrastructure, rolling stock and other fixed assets and for the operation of freight and passenger services. It is also the sole owner of the Turkmenistan State Railways company.

The condition of the rolling stock in Turkmenistan, as well as in the majority of other Central Asian countries is poor and obsolete. Recently, the Turkmenistan Ministry of Railway Transport established cooperation with the Chinese Mechanical Import and Export Group Co.Ltd and CSR Ziyang on the supply of new freight locomotives, shunting locomotives and spare parts. In total, CSR Ziyang has already supplied almost 140 locomotives to Turkmenistan.

Uzbekistan

The Uzbek railway network comprises more than 4,000 km of lines, of which 762 km constitute part of the TRACECA rail corridor and are double track. 618 km of the whole railway network are electrified.

In general, the Uzbek railway infrastructure is considered to be in good condition. However, there are some very old sections which considerably limit train speed (e.g. the rail link between Bishkek and Kazakh border was built in 1924 and the average speed there is less than 40 km/h).

Despite the fact that Uzbekistan is one of the three CIS countries with wagon construction and renewal possibilities, the condition of the rolling stock is old and obsolete. In addition, there is a shortage of the specialised wagons and Uzbekistan Railway owns very few containers. Almost all of the containers used for transporting goods in and out of Uzbekistan are owned by shippers or by foreign railways, foreign freight forwarders, foreign logistics companies and foreign container leasing companies[67].

Uzbekistan Railway carries containers in “home grown” flat wagons by removing the box from old box wagons. It also moves containers in whatever wagons that is able to accommodate a container. This includes rail wagons designed for carrying lumber and

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[66] Web page of CCTT

[67] International Logistics Centers/Nodes network in Central Asia, Task report A – Uzbekistan, September 2009, p 50 – 51

tree logs. The inappropriate placement of containers in rail wagons that are not designed for container carriage, results in damage to the container and its cargo and damage to the rail wagon.

4.2 Institutional framework and railway liberalisation process

The liberalisation of the railway transport in the studied countries is in very different stages of progress.

In the EU countries, such as the Netherlands, Germany, Poland and Hungary the liberalisation process follows that established by the EU path and is described in more detail in the RETRACK Deliverable 2.7

In **Azerbaijan**, a decree was issued on July 20, 2009 by the president of the Republic of Azerbaijan; “Azerbaijan State Railways” has been converted to “Azerbaijan Railways” Closed Joint-Stock Company. As a result, structural changes have been carried out and new relevant departments have been established. The Government has also started the 2010 – 2014 State Programme for Railway Development, which also focuses on the railway sector reform. On March 2, 2010 the four line business units of ADY were approved: Infrastructure, Freight Operation, Passenger Services and rail Track and Equipment Construction and Maintenance. Currently the railway reform process in Azerbaijan is supported by the World Bank Rail Trade and Transport Facilitation Project.

In the past **Georgia** had an unsuccessful attempt to privatise the Georgian Railway LLC. Currently, the railway infrastructure and operation are still in the ownership and responsibility of the GR LLC which is a fully integrated and a 100% state-owned company. It was founded in 1992 after the transformation of the Transcaucasia Railway. At present, GR LLC operates under the public law of the Enterprise Management Agency that is part of the Ministry of Economic Development. In 2009 three separate branches were created: Freight Traffic, Infrastructure and the Passenger Branch. GR LLC is free to set its own railway tariffs and grant discounts on the basis of commercial negotiation with the user. Over half of the GR LLC traffic and revenue is provided by oil and by-products moving in transit from Kazakhstan, Turkmenistan and Azerbaijan.

In 2002 the **Kazakhstan** State Railway (KTZ) was converted into a closed joint-stock company which in 2004 was further converted into the joint-stock company with a single shareholder - National Welfare Fund “Samruk – Kazina” - executing corporate governance of the holding. Currently, KTZ acts as a holding company with 22 wholly owned subsidiary joint-stock companies. Among them for example is Kaztemirtrans and is responsible for the operation of the freight rolling stock and transportation of cargo; JSC Locomotives is responsible for providing all users with equal access to locomotive haulage services; JSC Wagon services leases wagons owned by KTZ to freight carriers; JSC Keden-transservice is responsible for loading/unloading at yards to freight carriers, including feeder transport services. Finally, Kaztransservice is responsible for the planning of container transport and freight cars and for the coordination with other railway administrations. The Kazakh Ministry of Transport and Communications controls KTZ activity through the national transport and railway policy. In May 2010 the Strategy of the KTZ development up until 2020, which foresees the further railway sector reform was approved. In the framework of this strategy, private operators have received access to the national railway network and the tariffs for the use of infrastructure and access rights are currently regulated by the Agency of the Republic of Kazakhstan for regulation of natural monopolies. Participation of private operators is foreseen both for freight and passenger transport. KTZ will concentrate on the operation of the main business units (e.g. freight and passenger transport, rolling stock maintenance, locomotives operation, etc) and will sell all non-key business units. The railway infrastructure will remain a natural monopoly while being a separate unit of KTZ.

The **Mongolian** railway network is managed by the Russian-Mongolian Joint Stock Company Ulaanbaatar Railway (UBTZ) and is the only railway company in Mongolia. UBTZ is a joint stock company with equal shares of the capital stock from the Russian and Mongolian side. The Russian shareholder is the Federal Agency for Railway Transport. In 2009 the control of the Russian government's stake in UBTZ was transferred through the President’s decree to RZD for a period of five years.

The Russian Railways JSCo (RZD) was formed in 2003 as a result of a structural reform. The RZD is a centrally controlled and 100% state-owned company. It retains the ownership of the main railroad network in **Russia** and of all the infrastructure related to passenger and freight services. The concept for the restructuring of railways proposed a 49% privatization of companies providing freight forwarding services; other 51% of share should be state-owned. Privatization procedures will also apply to enterprises engaged in the repair of rolling stock and the production of spare parts and other products of railway transport. At the same time the concept confirmed that the railways were a natural monopoly with direct control from the state. Given the fact that the restructuring concept was announced in 1998 and so far very little has changed, even limited privatization will be a long process.

The main affiliates of RZD are currently the most important players of the Russian freight rail market. These are First Freight Company OJSC, Second Freight Company OJSC, TransContainer OJSC and Russkaya Troika CJSC. These companies are described more in detail in the Annex 4 to this report. With regards to the foreign companies, there are only a few options for entrance to the Russian railway market: direct access, a joint venture or access through a broker or agent. Direct access is the most complicated way as it requires a process to obtain a license for providing transportation services in Russia. Joint Ventures are the most common option and entering the railway market through a local freight forwarding/logistics agent is the most reliable and cost-effective.[68]. Some successful examples of the joint ventures are a partnership of the Far Eastern Shipping Company with RZD (creation of Russkaia Troika Ltd), the joint venture of Deutsche Bahn AG named Trans Eurasia Logistics Ltd and the acquisition by the Independent Transportation Company of the controlling stake of the Freight One OJSC.

The legal and organisational basis of the railway transport functioning in **Turkmenistan** is defined by the Law “On Railway Transport” (adopted on September 15, 1998). This Law determines that the State maintains monopoly on the ownership of the railway network in the country: Turkmenistan State Railways is the 100% state-owned railway operator. Article 3 of the Law allows legal and physical persons to own local railways,

[68] Russia: Opportunities for Russian Far East Railroads, U.S. Commercial Service, 2006

rolling stock and containers. The latter is in a direct contradiction with the Law on Licensing of Certain Types of Activities which does not set the licensing requirements for freight forwarding activities by railroad. Only the carriage of dangerous goods by railway falls under the mandatory licensing. As indicated in the MoS country report, there are existing private freight forward companies, but there are no plans to increase the role of the private sector in railway operation.

The entire railway system in **Uzbekistan** is managed by the state joint stock company Uzbekistan Temir Yullari (UTY). The government began reforming its railway sector in 1997 with assistance from the Asian Development Bank. Ancillary services were privatised and separated from the core rail operations and public and private forwarding organisations were established. For some core activities UTY is currently retaining a 51% shareholding: passenger services (JSC Uzjeldorpass); wagon repair (JSC Uzremvagon); refrigerated transport (JSC Dorreftrans); container transport (JSC Uzjeldorcontainer); and the Tashkent coach repair plant. Railway infrastructure management and operation is considered as a government monopoly and the freight and passenger railway transport has been declared open for the private sector[69].

4.3 Multilateral and bilateral agreements in the region

Countries which are part of the three studied corridors are parties in multiple cooperation agreements which determine trade and transport processes within the region.

The majority of the countries of the corridors studied in the Deliverable 13.2 are the members of the **Commonwealth of Independent States (CIS) regional intergovernmental organisation** which was founded in **December 1991**. As of December 2010, the full CIS members are: Armenia, Azerbaijan, Belarus, Moldova, Kazakhstan, Kyrgyzstan, the Russian Federation, Tajikistan and Uzbekistan. Turkmenistan is an associate member and Ukraine is a founding and participating country, but legally not a member country. As of 2009 Georgia is no longer a member of the organisation. In 2007 the MS ratified The Concept of the further development of the CIS, where the economic cooperation between the MS was highlighted as the highest priority for the future development. The latter involves the implementation of the Free Trade Zone and further liberalisation of the trade between the CIS MS. In regards to the transport development, the set priorities are the development of the transport corridors within CIS; establishment of the efficient tariff policy and elimination of the fiscal and administrative barriers for transport on national level; intermodal transport development for transit transport; and harmonisation of national air traffic management for CIS countries.

69 Uzbekistan: Railway Modernization Project, ADB Completion Report, March 2008

Coordination of transport and trade facilitation and specifically rail transport within CIS is organised through several authorities:

- The Council of Heads of Customs services of the CIS MS (at least once in three months; participation of all 11 MS);
- Coordinating Transport Meeting of the CIS (once a year; Armenia, Belarus, Kazakhstan, Kyrgyzstan, Moldova, RF, Tajikistan and Ukraine);
- The Council on Rail transport (at least twice a year; all the CIS MS except Azerbaijan).

On September 23, 2011 the CIS MS came to a decision on the creation of the CIS transport corridors Coordination Committee which will coordinate the activity of the MS on the development of the corridors. In order to achieve established goals on the development of railway transport, on October 18, 2011 the Heads of the CIS Governments adopted the Concept of the strategic development of railway transport in the CIS MS up until 2020. This Concept determines the common strategic priorities in the development of the CIS railways. It defines a set of measures which aim to increase the efficiency of the international freight and passenger transport. This document will provide a foundation for the future development of international regulations and targeted intergovernmental programmes of railway transport development. Development of information and telecommunication technologies and the creation of multimodal logistics centres at the critical nodes of railways are considered as priorities for the common railway transport development. In regards to freight transport, special attention in the Concept is given to the improvement of the transport management: coordinated usage of wagons and containers, current practice of the freight transport scheduling, increase of the freight and container trains' speed and increase of the container transport. The harmonisation of technical standards in the national railways was given priority because of the different technical regulations on railways within the different MS.

In October 2000 some countries decided to move even further forward and signed the Treaty on the establishment of the **Eurasian Economic Community** (EurAsEC). Currently, the EurAsEC members are Belarus, the Russian Federation, Kazakhstan, Kyrgyzstan, Uzbekistan and Tajikistan. Moldova, Ukraine and Azerbaijan have an observer status. The objective of the organisation is to establish a free trade area and a customs union among participating members, to develop common external economic policy, tariffs, prices and other features of a common market and to coordinate national approaches while integrating into the world economy and the international trade. The transport, energy and agriculture sectors and work force migration were set as the organisation's priorities.

In December 2008 the supranational body - the EurAsEC Customs Union Commission was created. Its work resulted in the establishment by the Russian Federation, Kazakhstan and Belarus in **July 2010,** of the **Customs Union** with an objective to promote trade and transport by removing customs borders between participating countries. From **January 1, 2012** these three countries are expected to introduce the **Common Economic Space**. It is expected that Kyrgyzstan and Tajikistan will soon join the Customs Union. The entry into force of the Common Economic Space means the freedom of movement of goods, services, capital and workforce between the Member States. The main trade restrictions have to be removed.

On October 19, 2011 8 of the 11 CIS MS signed an agreement for the creation of the **Free Trade Zone.** Azerbaijan, Uzbekistan and Turkmenistan have not signed the agreement. In the framework of the Free Trade Zone export and import duties on a vast number of goods will be cancelled. Negotiations will continue further for some groups of goods for which this agreement is not yet applicable. The next step is the ratification of the Agreement on the national level of each MS.

The current members of the **Economic Cooperation Organisation (ECO)** which was created **in 1985** are: Afghanistan, Azerbaijan, Iran, Kazakhstan, Turkey, Tajikistan, Pakistan, Kyrgyzstan, Turkmenistan and Uzbekistan. The main purpose of this organisation is the promotion of economic, technical and cultural cooperation among its MS. Progressive removal of trade barriers and promotion of intra regional trade and development of transport communications are among the main organisational goals. The Directorate of Transport and Communications is responsible for the coordination of transport activities within the ECO. Within the last years the Directorate has been focusing on the elimination of the non-physical barriers on the main transit transport routes of the region and the development of the physical infrastructure of the “East-West” and the “North – South” corridors. The Transit Transport Coordination Council (TTCC) began its work when the Transit Transport Framework Agreement entered into force in May 2007. A special Railway Committee within the TTCC is coordinating the facilitation of the railway transport within the MS.

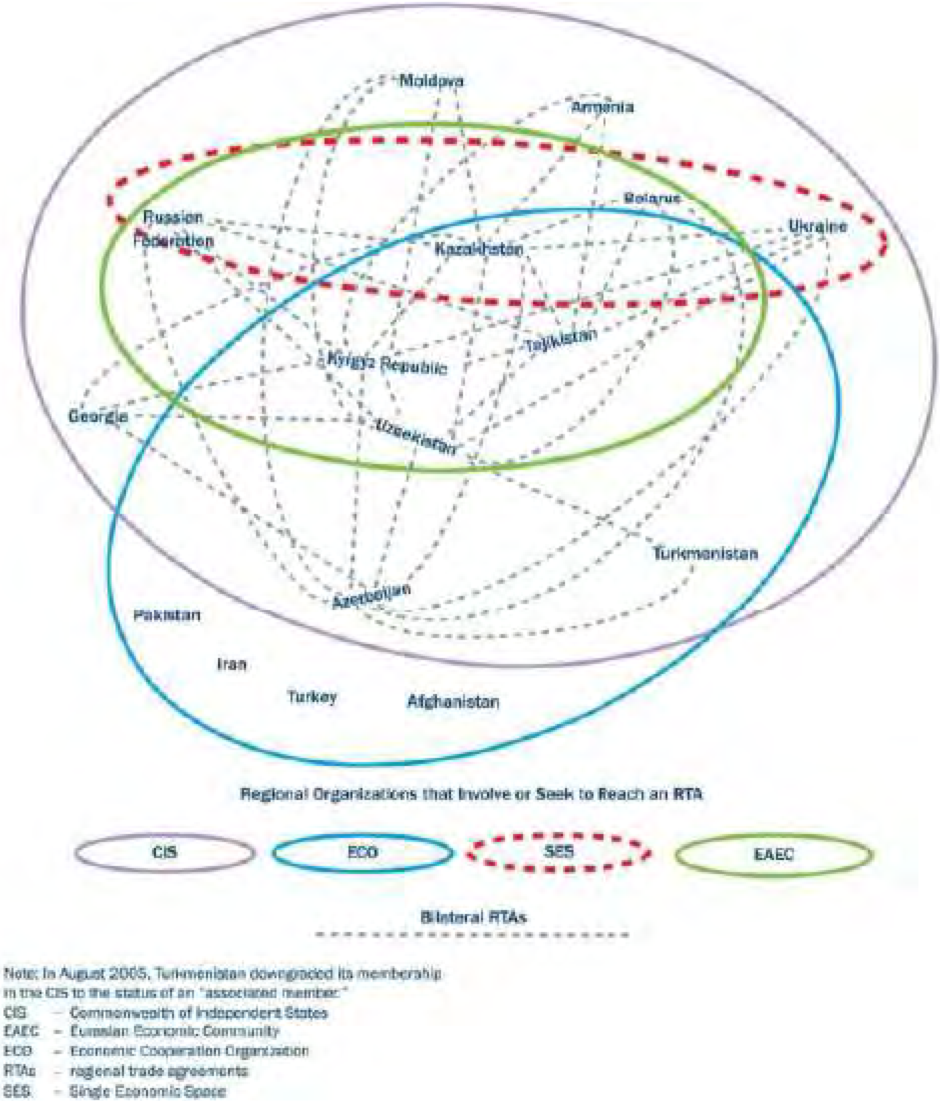
Since **June 2001, The Shanghai Cooperation Organisation (SCO)** has brought together the PRC, Kazakhstan, Kyrgyzstan, the Russian Federation, Tajikistan and Uzbekistan. Even though the cooperation on security is a primary goal of this organisation, economic cooperation is also on its agenda.

The **Black Sea Economic Cooperation organisation (BSEC)** was created in **June 1992.** Albania, Armenia, Azerbaijan, Bulgaria, Georgia, Greece, Moldova, Romania, the Russian Federation, Turkey and Ukraine are Member States. Transport is one of the multiple cooperation areas, with a primary focus on the improvement of the intra-region transport capacity and the increase of the Black Sea transit potential. Transport questions are regulated within a specially created Working Group on Transport. In April 2007 the work of the BSEC resulted in the signature of the Memorandum of Understanding on the Development of the Motorways of the Sea in the BSEC region. Work on gradual liberalisation of the road transport and on the promotion of the Euro-Asian transport corridors is also under way.

Other regional initiatives and bi-lateral agreements exist, which bring countries together, but have another main activity scope than economic or transport development (e.g Black Sea Forum for partnership and dialogue).

Figure 10 presents a so-called “spaghetti bowl” of regional trade agreements which have been formed by the participation of TransSib, TRACECA and the Central corridor countries in different international initiatives and agreements.

Figure 10: The "Spaghetti Bowl" of Regional Trade Agreements involving the TransSib corridor, the TRACECA and Central – Kazakhstan countries



Source: TERA international group, REG: Central Asia Regional Economic Cooperation Transport Sector Strategy Study, December 2008, Appendix 3, p. 124.

Furthermore, some organisations/agreements have harmonisation and improvement of the railway systems within the countries as a main goal. The largest of these organisations on the TransSib corridor are: OSJD and CCCT.

The **Organisation for Cooperation Railway Lines (OSJD)** brings all the member countries of the TRACECA corridors, the Russian Federation and other countries together. The main objectives of the OSJD are to develop and improve international railway transport between Europe and Asia, coordinate the development of the international railway transport policies and laws in the Member States, improve the competitiveness of the railways in comparison with other transport modes and to provide technical and economic cooperation in relation to railway issues.

The **Coordinating Council on Trans Siberian Transportation (CCTT)**

The International Association "Coordinating Council on Trans-Siberian Transportation" (CCTT) is a non-commercial transport association which was created in February 1997. It was founded by the Ministry of Railway Communication of the Russian Federation, DB AG (Deutsche Bahn), GETO (Association of European Trans-Siberian Operators), and KIFFA (Korean International Freight Forwarders Association). Presently the CCTT consists of 114 members from 22 countries, including major railways and shipping companies, operators and forwarders, ports and stevedoring companies, state organisations, administrations and municipalities, telecom and marketing companies, as well as security services and media. The main purpose of the Coordinating Council on Trans-Siberian Transportation is to attract transit and foreign trade cargo to the TransSib corridor, to coordinate activities of companies that participate in international cargo transportation on the TransSib, to ensure high-quality delivery of goods and the development of economic relations between countries of South-East Asia, the Far and Middle East, Central Asia and Europe, based on using the infrastructure of the Russian railways.

In regards to the TRACECA and Central Kazakhstan corridors, the functioning of the railway transport in the Central Asia region is also a subject of bilateral agreements on railway transport and other relevant topics. Some of the most important bilateral and multilateral agreements are listed below:

- Georgia and Azerbaijan signed an Agreement on coordination of railway transport (June 14, 2004), signed an Agreement on Customs Clearance of Transit Cargoes (February 3, 1993) and signed an Agreement on Background Customs Relations (February 3, 1993).
- Georgia and Kazakhstan signed a bilateral railway agreement (June 1, 1993) and signed an Agreement on Order of Transit (September 17, 1996).
- Georgia and Turkmenistan signed a bilateral railway agreement (August 17,,1993).
- Azerbaijan and Kazakhstan signed an Agreement between railway administrations on coordination of railway transport (November 5, 2001), signed an Agreement on the main principles in the transport sphere relations (February 24, 1993), signed an Agreement on transit cargoes, customs clearance and communication of customs authorities (February 24, 1993)
- Azerbaijan and Turkmenistan signed an Agreement on international combined transport (May 19, 2008)
- Kazakhstan and Turkmenistan signed an Agreement on the general principles of relations in the transport and communication fields (May 19, 1993) and signed a Cooperation Treaty in trade and economic, scientific and technical, as well as in cultural spheres till 2020 (May 28, 2007).
- Azerbaijan, Georgia, Turkmenistan and Uzbekistan signed an Agreement on Cooperation in Transit Carriages (May 13, 1996)
- Azerbaijan, Georgia, Ukraine signed an Agreement on cooperation in establishing and function of international Euro-Asian transport corridor (December, 15 1996)

Bi-lateral agreements establishing cross border and transit traffic rights predominate. The multilateral agreements act mostly as framework statements. There are no operating transit agreements between the PRC and other Central Asian countries.

Other international initiatives which are very important to the countries of the assessed corridors have already been addressed in Chapter 2 of the current deliverable. These are, in particular: EC TRACECA and Pan – European Corridors programmes, ADB CAREC corridors Programme, UNECE TER and UNESCAP TAR projects and etcetera..

4.4 Summary of the infrastructure condition and institutional framework of the railway transport in the countries involved in the corridors

The assessment of the railway infrastructure in the countries involved in the studied corridors has shown that countries dispose a solid railway network which provides possibilities of connecting the EU and China by rail. At the same time, the condition of the infrastructure in the majority of countries is poor and is characterised by the high level of deterioration. Low investments in the railways result in the poor maintenance and rehabilitation of infrastructure sections. Additionally, rolling stock is not renewed properly and this impacts the general performance of the railway transport in terms of cost, lead time and safety. The freight train speeds vary from 60-80 km/h, being restricted to 30-40 km/h on some sections within particular countries. The maximum axel load varies from 23 t to 25 t. Some countries are experiencing a vast shortage of railway wagons and containers, as well as the infrastructure that can support the development of the intermodal transport.

Central Asian countries and Russia are making the first steps towards railway sector reforms. The opening of railway infrastructure access is slow, but is now in progress. In the majority of the countries the separation between infrastructure and freight and passenger operation within the national railway operator companies has taken place. Infrastructure management and operation in all of the countries preserves natural monopoly status. Therefore, train pass allocation, access to the terminals and infrastructure charging are fully dependent on the national operator. As for the freight and passenger operation, Uzbekistan, Kazakhstan and the Russian Federation have declared an open access.

All of the countries are actively involved in different international and bilateral agreements which provide a legal basis, as well as an operational framework for the cooperation in the region.

5 Trans-Siberian corridor

In the following sections the features that are particular to the Trans-Siberian corridor and the three routes to and from China, which use the Trans-Siberian corridor are described.

5.1 Organisational model of the corridor

The Trans-Siberian railway network builds the backbone of the North route for the Trans-Eurasian Connection. Using its branch lines to Kazakhstan, Mongolia and China in the Eastern part and linkages via Belarus/Poland or Ukraine to Western Europe, it offers several possibilities to connect the RETRACK Corridor with China. The following chapter will give an overview of three connections by West - East pattern.

These routes correspond with the already established UN TAR Northern corridor.

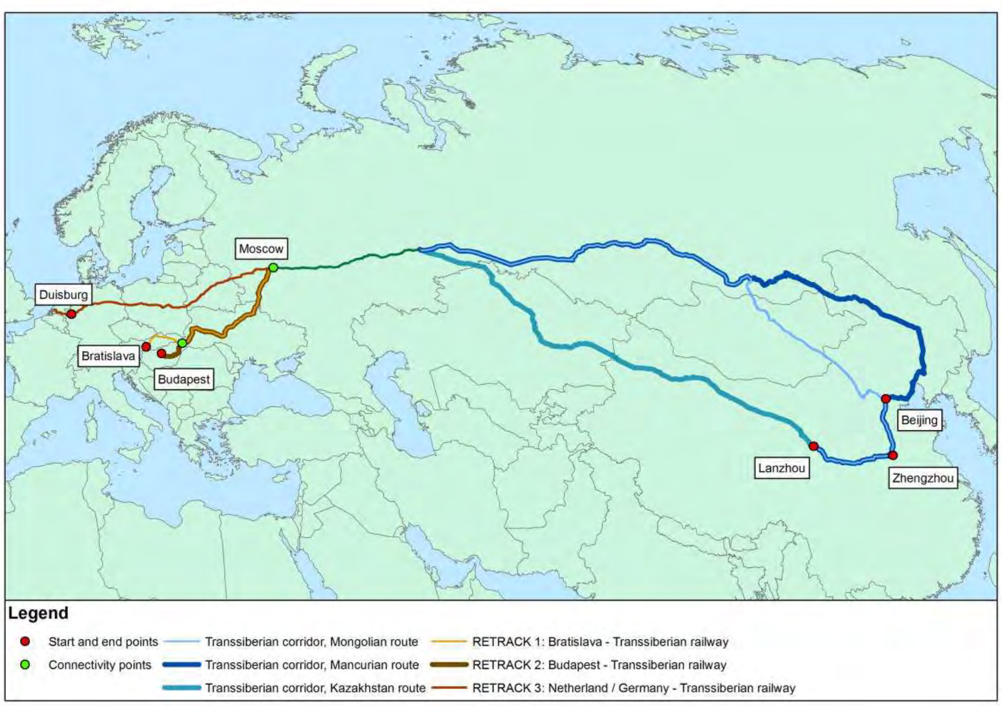
- TransSib – China via Kazakhstan (TransSib- Trans Kazakh route)

- TransSib – China via Mongolia (TransSib - Mongolian route)

- TransSib – China via Zabaykalsk (TransSib-Manchurian route)

These routes, as well as their possible interconnections with the RETRACK corridor are presented in the figure below.

Figure 11: TransSib corridor and associated railway routes



Among these routes, the TransSib - Mongolian route offers the shorter distance for rail transport between Moscow and Beijing and the TransSib – Trans Kazakh route is favourable for the transportation to and from Western China. The TransSib - Manchurian route is the shortest route for transportation between Moscow and the ports at the Yellow Sea or to locations in Northeast China.

The organisational model of the corridor is characterised by the national railway systems participating in the routes. The main market players in container transport are described in the table below.

Table 26: Principal Market players in container transport via Transsiberian corridor

Market Player	Function	Example
Shipper	Cargo owner, client of forwarder	Siemens-Fujitsu, BSH, BMW
Forwarder	Organises transport on behalf of shipper	Kuehne&Nagel, DB Schenker
Container Operator	Container carrier, organises dedicated block trains or single container transports	InterRail Services, Trans Eurasia Logistics, HUPAC, Rysskaya Troyka
Railway Agency in country	Books transport on behalf train operator, bears currency exchange risks	Kaztransservice, Transrail,
National Railway Company	Provision of traction, infrastructure, tariff policy, wagons and time tables	Russian Railways RZD, Belarussian Railways
Affiliated company for container transport	Organises and operates intermodal transport on behalf of railways	DB Intermodal, Transcontainer, Freight One Transport Company, Freight Two Transport Company
Private Waggon Owners	Owns private platforms for own carriage and for renting out	Transcontainer, First Freight Company, Second Freight Company
Container owners	Owns containers for own transport and/or leasing; shipping companies, leasing companies	Maersk, Evergreen, Seaco, Triton, etc.
Terminal Operator	Handling of containers on behalf of container transport companies and container owners	DUSS, Transcontainer
Customs Clearance Agents	Customs clearance on behalf of forwarders	

The transport organisation is characterised by a multi-level contractual system which combines the different national systems depending on the route configuration.

The container operator concludes rail transport contracts with the national railways or their affiliated companies responsible for intermodal transport via its own or other rail agency in each individual country. The clients of the container operator are usually forwarders and not the shippers in order to ensure neutrality. In regards to wagons and containers the container operator may own both but in most cases the operator usually has to rent wagons and containers. Containers may also be owned by shippers.

It should be noted that there is no central organisation or corridor management but a variety of different players which form a contractual network. In comparison to sea transport the TransSib corridor comprises a higher number of the market players due to the split into nationally organised railway systems. In contrast to sea transport where container carriers usually have their own worldwide network of branch offices, in the TransSib railway market container operators use at least one national rail agent in each country. The rail agent is responsible for freight quotations in USD and for the booking of transport as an agent as well as for bearing the currency exchange risk because he calculates the freight rates from national currency into USD or Euro.

From the viewpoint of the container operator the national railways and respectively their affiliates for intermodal transport are responsible for the provision of infrastructure and traction. In Russia the RZD comprises internally 16 Railway Directorates that are responsible for the operation and maintenance of the rail infrastructure and for the implementation of extension or rehabilitation projects. Furthermore, the directorates are, among others, competent for signalling, railway stations, marshalling yards, maintenance and repair of rolling stock, respective railway works and workshops and for allocation of staff for overall rail operations within the respective Directorate. Nine Railway Directorates are involved on the TransSib main route from Moscow to Vladivostok (Annex 5).

All railways of the countries along the TransSib corridor (Russian Federation, Kazakhstan, Mongolia) are members of the Organisation for Cooperation Railway Lines (OSJD) and of the Coordinating Council on Trans Siberian Transportation (CCTT). The main objectives of the OSJD are to develop and improve international railway transport between Europe and Asia, coordinate the development of the international railway transport policies and laws in the Member-States, improve the competitiveness of the railways in comparison with other transport modes and to provide technical and economic cooperation in relation to railways issues. The main purposes of the CCTT are attracting transit and foreign trade cargo to the TransSib and coordinating activities of companies participating in international cargo transportation on the TransSib.

In Eastern Europe and Asia the international carriage of passengers and goods by rail is regulated by the SMPS and the SMGS international conventions. The majority of the Member-States of OSJD (which are sometime also members of OTIF) apply both of these conventions.

5.2 Infrastructure assessment of the TransSib corridor

Each of the three identified routes comprises respective sections of the TransSib main route, TransSib branch lines and sections of the national railway network. Section xxx gives a brief overview of the infrastructure of the TransSib main route, which is crucial for each of the three studied routes.

5.2.1 Technical and operational characteristics of the main route of Trans-Siberian Railway

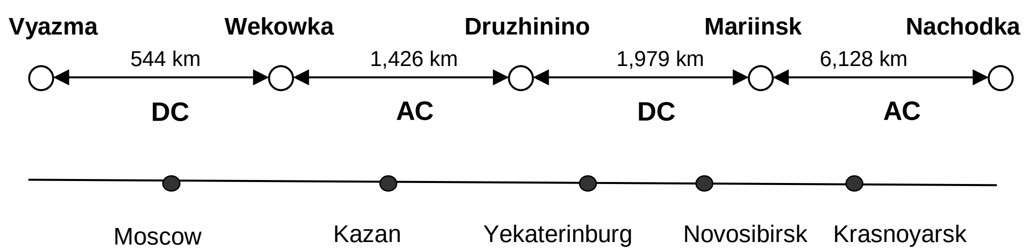
Routing: Moscow (RF) –Yekaterinburg (RF) – Tymen (RF) – Omsk (RF) – Novosibirsk (RF) – Krasnoyarsk (RF) – Irkutsk (RF) – Ulan-Ude (RF) – Chita (RF) – Khabarovsk (RF) – Vladivostok (Nakhodka) (RF)

Technical characteristics of the route

The main route of the Trans-Siberian railway originates in Moscow and ends in the sea port Nakhodka near Vladivostok on the Far Eastern coast. It is 9,288 km long, a double track and fully electrified. It operates under two different power supply systems for electric locomotive operation: at 25kV AC and 3kV DC. The segments between Wekowka and Druzhinino (1,426 km), Mariinsk and Nachodka (6,128 km) are electrified at 25 kV AC. The segments between Moscow and Wekowka (544 km), Druzhinino and Mariinsk (1,979 km) are electrified at 3kV DC. Figure 12 gives an overview of current data for the separate railway network sections within TransSib.

Figure 12: Different power supply systems within the Transsib

Power supply change stations on the TransSib main route



Major stations on the TransSib main route

The traction of freight trains on the DC-electrified sections is carried out by locomotives VL10, VL11 and on the AC- electrified sections by electric locomotives 2ES5K, VL85 and VL80 of various modifications. Therefore, at least three changes of locomotives along the Trans-Siberian main route (from Moscow to Nakhodka) are necessary. The loading gauge of the main TransSib line is 1 – T.

The maximum allowed train speed for freight differs on separate line sections. It is 80 km/h on most of the line and 90 km/h on the sections with a total length of 151 km. The average allowed speed for freight trains, including slow passage sections, over the entire line is 76,7 km/h.[70]

[70] The development program for the railway container transportation using the Trans-Siberian Railway for the period up until 2015, 2009

The RETRACK relevant sections of the TransSib main route and corresponding TransSib branches are shown in Table 27. All three routes use the section Moscow-Yekaterinburg (1,805 km). The TransSib-Mongolian Route additionally uses the section Yekaterinburg-Zaudinskiy (near Ulan-Ude) and the route via Zabaykalsk additionally uses the section Yekaterinburg-Karymskaya (near Chita). Furthermore, each of the routes continues through the TransSib branch lines to Kazakhstan, Mongolia and China respectively. The branch line Yekaterinburg-Petropavlovsk (821 km) runs to the Russian/Kazakh border Petropavlovsk, the Mongolian route Zaudinskiy-Naushki (248 km) – runs up to the Russian/Mongolian border and finally, the Manchurian route Karymskaya-Zabaykalsk – runs up to the Russian/Chinese border (365 km).

Table 27: Length of the TransSib corridor sections up to the Russian border

Length of the TransSib main route sections, km		Length of the TransSib branch lines, km		Total length of the TransSib corridor sections up to the Russian border, km	
Route 1: TransSib-Trans Asian Route					
Moscow – Yekaterinburg	1,805	Yekaterinburg – Petropavlovsk	638	Moscow – Yekaterinburg - Petropavlovsk (Russian-Kazakh border)	2,443
Route 2: TransSib-Mongolian Route					
Moscow – Zaudinskij (near Ulan-Ude)	5,649	Zaudinskij – Naushki	248	Moscow – Zaudinskij - Naushki (Russian-Mongolian border)	5,897
Route 3: TransSib-Manchurian Route					
Moscow – Karymskaya (near Chita)	6,294	Karymskaya – Zabaykalsk	365	Moscow – Karymskaya - Zabaykalsk (Russian-Chinese border)	6,659

Source: Web pages of the territorial subsidiaries of RZD

Although the TransSib main route sections are well developed, completely electrified and considered to be double track, the TransSib branch lines are partly single track, not electrified and need modernisation.

Currently, the RZD is carrying out a complete reconstruction of the branch line Karymskaya which is expected to be finished in 2013.

In 2010 the RZD launched the project “TransSib in 7 Days”. The idea of this project is to organise a rapid carriage of containers from Far Eastern ports (Nachodka) to the Western borders of Russia (Krasnoe).[71] The purpose and the approach of the project are to increase the competitive railway container transportation between Europe and Asia and to discover the existing potentials for international transport through 1,520 mm area railways.

71 RZD Presentation, NEA & CCTT Business Forum, Haag, 18-19.05.2011

Within the project the essential technical and organisational measures for track, traction and rolling stock management, throughput increase, necessity of the renewal and upgrade of rail automatics and telemechanics on defined TransSib sections, measures for cooperation with other transportation participants and documentation and customs clearance should also be defined.

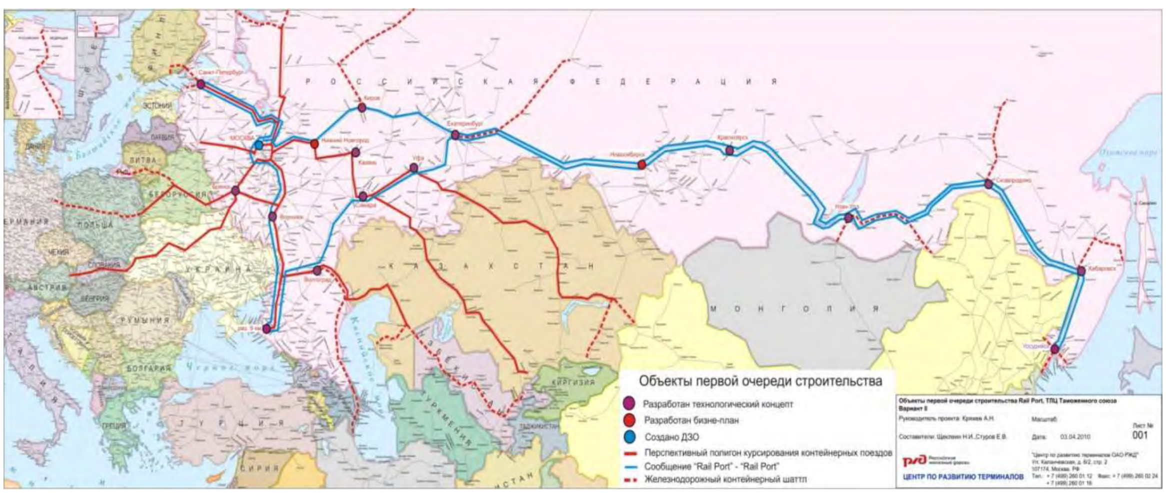
Furthermore, the RZD is going to introduce two system locomotives (25Kv AC/3Kv DC) for cargo trains, based on the good experiences made with the introduction of the first new locomotives for tow power supply systems for heavy passenger expresses. Moreover, new platform wagons and container carriage platform wagon types are currently under introduction, allowing for an increase of the number of TEU per train by up to 27% and a maximum travel speed of container trains of 120 km/h.

The final goal of the RZD is to increase the average container train speed from the present 800 km per day to up to 1,400 by the end of 2012 and further to 1,500 km per day by the end of 2015.

Main terminals on the route

The terminal Novosibirsk with an area of 30 ha is one of the largest terminals in Siberia and was opened in 2008. After the reconstruction of the railway infrastructure in 2010 it now has a capacity to operate two container trains per day. The terminal has two heated warehouses with an area of 10,000 sqm each, including a special area for temporary storing of customs cargo (1,250 sqm). The container storage capacity is 3,000 TEU.

Figure 13: Rail Container and Logistics Centre Development Plan – Phase 1 until 2020



Source: RZD, 2011

There is a shortage in container and in intermodal handling capacity in the Russian Federation, as well as along the TransSib Corridor. The Government of the Russian Federation and the RZD are aware of this shortage and introduced a long-term container handling facility and logistic centre development project named "Concept" in 2006. During the first project phase, 18 additional container movement and transshipment terminals were planned to be implemented by public - private investment schemes, 13 of which along the TransSib corridor.

The future increase of container terminal capacities within the Russian Federation will have an influence on the transit cargo flows via the RETRACK Corridor on the TransSib corridor to and from China. On the one hand, additional container terminals make additional trains and combinations of domestic and internationally operating trains feasible and therefore, transit services will be more competitive due to economy of scale and scope. For example, the lack of return cargo from Europe to China could be eased by additional Eastbound cargo to Russia. The container train “Eastwind” is already a good example for a joint production platform for European cargo, both for Russia and Asia. However, additional Russian container trains will compete with transit trains for the use of infrastructure and rolling stock capacity. Programmes to expand the Russian container handling capacity could, therefore, result in enhanced infrastructure stress and further railway capacity expansion needs.

5.2.2 Technical and operational characteristics of the TransSib – Trans Kazakh route

Routing: Moscow (RF) – Yekaterinburg (RF) – Kurgan (RF) – Petropavlovsk (KAZ) – Astana (KAZ) – Mointy (KAZ) – Aktogay (KAZ) – Dostyk (KAZ) / Alashankou (PRC)

Technical characteristics of the route

TransSib – Trans Kazakh route originates in Moscow and travels across Russia and Kazakhstan to China. The distance from Moscow to the Chinese border is 4,358 km. Table 28 summarises the main technical characteristics of the route.

The Kazakh part of the route from Petropavlovsk, via Astana and Karaganda up to Monty, is electrified and double track (1,071 km). From Monty, via Aktogay up to Dostyk, the route is single track and not electrified (839 km)[72]. The electrification system on this section of the TransSib in Russia is based on 3 kV DC, while the electrification system in Kazakhstan was introduced later and hence is based on 25kV AC 50 Hz. Due to the different electrification systems at the southern TransSib connection between Yekaterinburg and Omsk and in Kazakhstan, modern two system locomotives, or a locomotive change is required.

The maximum train length on this route is 1,000m and the maximum train mass is 2,800t. The maximum axel load on the Russian sections is 25 T and 23 T on the Kazakh sections. The loading gauge of the TransSib – Trans Kazakh route is 1- T.

The electrification of the segments Aktogay-Dostyk (309 km) and Monty-Aktogay (522 km) are planned between 2015-2018, according to the “National Industrial and

[72] The Study for the project of the integrated logistics systems and marketing action plan for container transportation, JICA, December 2007

Innovative Development Programme of the Republic of Kazakhstan for the period 2010-2014".

Table 28: Characteristics of the TransSib – Trans Kazakh route by segments

Section of the route	Country	Distance, km	Double track, km	Electrification, km
Moscow - Yekaterinburg	Russia, main TransSib	1,805	1,805	1,805 with 3 kV DC, 25kV AC 50Hz
Yekaterinburg – Petuhovo/Petropavlovsk	Russia, TransSib branch	638	638	638 with 3 kV DC, 25kV AC 50Hz
Petuhovo/Petropavlovsk	Russia – Kazakhstan border	Locomotive change, technical inspection, border crossing procedures		
Petropavlovsk – Dostyk	Kazakhstan	1,910	1,071	1,071 with 3 kV DC, 25kV AC 50Hz
Total		**4,353**	**3,514**	**3,514 with 3 kV DC, 25kV AC 50Hz**

Source: OSJD Rail transport corridor n 10, 2010

Main terminals on TransSib – Trans Kazakh route

In addition to Novgorod and Yekaterinburg, which are important terminals on this section of the TransSib, the Kurgan and Petropavlovsk terminals are also of importance for this route.

The Petropavlovsk railway station is a marshalling yard, equipped with a mechanised uphill of the average power, two-way dispatch and sorting parks. The processing capacity of the station is 276 wagons a day.[73] Although the Petropavlovsk railway station is situated within the territory of Kazakhstan, it organisationally still belongs to the RZD.

One of the important container freight terminals on the route is the Astana freight terminal, which has an area of 200,000m², consisting of container loading yards, general cargo handling space, heavy cargo yards, coal handling space and cargo storage. There are several problems such as obsolete loading facilities, unpaved cargo space and cramped working spaces and the access road to the freight station is unpaved and narrow.[74]

Currently, the Ministry of Transport in Kazakhstan is focusing its priorities on the China – Russia transit corridor: there are a total of 12 proposed logistics centres included in the

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[73] http://keden.kz/ru/city_rk/petropavlovsk.php

[74] The Study for the project of the integrated logistics systems and marketing action plan for container transportation, JICA, December 2007

MOT's strategy with the majority laying in the scope of the TransSib – Trans Kazakh route.

5.2.3 Technical and operational characteristics of the TransSib – Mongolian route

Routing: Moscow (RF) –Yekaterinburg (RF) – Tymen (RF) – Omsk (RF) – Novosibirsk (RF) – Krasnoyarsk (RF) – Irkutsk (RF) – Ulan-Ude (RF) – Zaudinskiy (RF) – Naushki (RF)/ Suhe Bator (MON)- Ulan Bator (MON) - Zamyn Uud (MON)/ Erenhot (PRC)

Technical characteristics of the route

The following route originates in Moscow and travels across Russia and Mongolia to China and is 7,021 km long. The route uses the section of the TransSib main route from Moscow up until Zaudinskiy near Ulan-Ude (5,649 km long) and continues with the TransSib branch line to the Russian-Mongolian border in Naushki (253 km long). The distance of the Mongolian section of the route connecting Russia and China is 1,111 km.

Table 29: Characteristics of the TransSib – Mongolian route by segments

Section of the route	Country	Distance, km	Double track, km	Electrification
Moscow - Zaudinsky	Russia, main TransSib	5,649	5,649	5,649 with 3 kV DC, 25kV AC 50Hz
Zaudinsky – Naushki/Suhe Bator	Russia, TransSib branch	253	0	Not electrified
Naushki/Suhe Bator	Russia – Mongolia border	Customs clearance, locomotive change, technical inspection, border crossing procedures		
Suhe Bator – Zamyn Uud	Mongolia	1,111	5	Not electrified
Total		**7,021**	**5,654**	**5,649 with 3 kV DC, 25kV AC 50HZ**

Source: OSJD Rail transport corridor n 1, 2010

The section of Zaudinskiy-Naushki is single track, non-electrified, equipped with automatic locking and centralised dispatching and traction services are provided by diesel locomotives 2ТЭ10М, 2ТЭ10У. At the border between Russia and Mongolia, transshipment is not needed because of the same gauge width (1,520 mm). From the Mongolian border station Suhe Bator the single gauge railroad goes through the territory of Mongolia via Ulan-Bator to the Zamyn Uud station at the Mongolian-Chinese border. The loading gauge on the whole route is 1 - T.

The maximum freight train length on the route is 1,000m. The maximum freight train mass on all the sections is 2,800t. The maximum axel load on the Russian railways is 25 tonnes and "up to 25 tons" or "according to the RZD/SZD infrastructure standards" for the Mongolian section of the route. The maximum speed is limited to 60 km/h for the Mongolian part and 80 km/h on the Russian railways.

The prospective traffic increase on the Russian section of the route Yekaterinburg – Naushki requires further strengthening of the infrastructure on this railway section. The RZD plans to invest about 800 million USD in modernisation of the branch infrastructure, and in particular modernisation of the border crossing station Naushki and the lengthening of the receiving and departure tracks and amplification of the traction power supply devices. The lengthening of the receiving and departure tracks up to 1,050m at some stations on this section is already underway.

Main terminals on the TransSib – Mongolian route

Zamyn Uud is situated in a low developed, isolated desert area in Mongolia on the Southeast border with China. The transshipment station at Zamyn Uud, which was developed with Japanese assistance, has been in operation since 1995. The transshipment facility of Zamyn-Uud railway station has a capacity to load and unload 5 freight trains on a wide gauge and 2 freight trains on a narrow gauge within 24 hours. The total transshipment capacity between the wide (Mongolian) and the narrow (Chinese) gauges is 12,000 containers and 2,520 freight wagons per year.[75]

With support from the Asian Development Bank (ADB), Mongolia will build a new intermodal Logistics Centre near Zamyn Uud, which will put up a new container terminal with road and rail links to Zamyn Uud. According to the ADB, the terminal will be located approximately 9 km from the Chinese border crossing point, 5,7 km from Zamyn Uud town and 5 km from the existing freight terminals of the Mongolian railway. It will have modern customs and quarantine facilities with road and rail access, which will reduce transit times and expand capacity. The management of the facility will be contracted out to a private operator.

5.2.4 Technical and operational characteristics of the TransSib – Manchurian route

Routing: Moscow (RF) –Yekaterinburg (RF) – Tymen (RF) – Omsk (RF) – Novosibirsk (RF) – Krasnoyarsk (RF) – Irkutsk (RF) - Ulan-Ude (RF) – Chita (RF) – Karymskaya (RF) – Zabaykalsk (RF) / Manzhouli (PRC)

Technical characteristics of the route

The following route originates in Moscow and follows through to the PRC around the Eastern border of Mongolia but not crossing it. It is 6,660 km long (up until the Chinese border). Table 30 describes the major segments along this rail route.

[75] http://www.investmongolia.com/forum/projects/tusul26.pdf

Table 30: Characteristics of the TransSib – Manchurian route by segments

Section of the route	Country	Distance, km	Double track, km	Electrification
Moscow – Karymskaya	Russia, main TransSib	6,294	6,294	6,294 with 3 kV DC, 25kV AC 50Hz
Karymskaya – Zabaykalsk	Russia TransSib branch	366	148,4	148,4 with 3 kV DC, 25kV AC 50Hz
Total		**6,660**	**6,442,4**	**6,442,4 with 3 kV DC, 25kV AC 50Hz**

Source: OSJD Rail transport corridor n 1, 2010

The segment Moscow-Karymskaya of the route is double track and electrified. Electrification of the segment Karymskaya-Olovyannaya (148,4 km) on the branch line Karymskaya–Zabaykalsk was completed in June 2011. The segment Olovyannaya-Zabaykalsk is currently single track and not electrified. It is planned to complete electrification of the entire branch line Karymskaya-Zabaykalsk in 2013 according to the RZD development programme “The strategy of development of railway transport in the Russian Federation until 2030". The most difficult section of the route runs through the Zabaykalskij region and mostly along the larger and smaller rivers through difficult, low-mountain terrain, with some segments requiring the encouraging locomotives.

The maximum freight train length on the route is 1,000m. The maximum freight train mass on all the sections is 2,800 T. The maximum axel load on the Russian railways is 25 tonnes and the maximum speed is limited 80 km/h. The loading gauge of the route is 1-T.

Main terminals on the TransSib – Manchurian route

Terminal Novosibirsk with an area of 30 ha is one of the largest terminals in Siberia and was opened in 2008. After the reconstruction of the railway infrastructure in 2010 the terminal now has a capacity to operate two container trains per day. The terminal has two heated warehouses with an area of 10,000 sqm each, including a special area for temporary storing of customs cargo (1,250 sqm). The container storage capacity is 3,000 TEU.

The Zabaykalsk station is located 2 km from the Russian-Chinese border and is the main overland gate for freight coming from China to Russia (80% of turnover). In 2008 JSC Transcontainer finished the major reconstruction of the terminal in Zabaykalsk, modifying it into a modern container logistics complex. The new terminal is equipped with a covered hangar, a container storage area suited for 230 40-feet containers and a special area for temporary storing of customs bound cargoes, equipped with the latest X-ray equipment. The terminal uses the latest handling equipment from the Finnish and Swedish producers: six reachstackers from KALMAR, two of them with the lifting capacity of 50 tonnes and four of them with the lifting capacity 12,5 tonnes. Their operation does not depend on weather conditions, what certainly is very important in the difficult climatic conditions of Zabaykalsk (strong winds, blizzards).

5.3 Strength and weaknesses: what potential clients thinks

5.3.1 Supply Chain Requirements for TransSib rail corridor

RETRACK deliverable 1.4 (Chapter 4) proposed a list of 15 key performance indicators for benchmarking of the rail transport. Seven of them appear to be of major importance to the potential RETRACK clients and therefore form the supply chain requirements for the corridor. These are: price, lead time (transit time), lead time (transit time variability), frequency of service, shipment compatibility, damages, theft and cargo pilferage. In the paragraphs below we describe the actual state of these factors in TransSib rail corridor.

Shipment compatibility

The RETRACK deliverable 1.4 (Chapter 4) indicates that shipment compatibility is a go/no go indicator. This performance measurement provides assessment of the possibility to use intermodal transportation in principle or compatibility of particular services. Due to historic reasons the countries along the Trans - Siberian Corridor (Russian Federation, Kazakhstan and Mongolia) inherited the common technological base of the railway infrastructure and traction and train operation standards. However, there are different speeds in further development of the signalling systems at main routes to be observed. For instance, the signalling technology introduced according to former Russian standards is presently under replacement in Mongolia by the EU ERTMS system.

Lead time and lead time variability

The lead time contains several components, such as transport time, container handling and processing time, customs clearance time, each of which influences the total duration on the route. Moreover, some other aspects have an impact on the travel time along the TransSib routes, such as technical differences on the route (gauge width, power supply), the number of border crossing points (different rules and regulations, ruling languages) and type of cargo. These aspects can also be a cause for lead time deviations on the routes. In the following paragraphs the lead times for the different routes are analysed.

Tables 31 and 32 present the lead time for the container transport by single wagon load traffic and block trains for the TransSib – Trans Kazakh route.

Table 31: Duisburg – Lanzhou transit time for the container transport by single wagon traffic via TransSib – Trans Kazakh route

RETRACK corridor section	Days, +/-
Duisburg – Malaszewicze	5
Reforwarding Malaszewicze – Brest	1
Brest - Moscow – Yekaterinburg – Kurgan – Petropavlovsk	7-8
Petropavlovsk – Astana – Mointy – Aktogay – Dostyk	11-12
Reforwarding Dostyk-Alashankou	3
Alashankou - Urumqi – Lanzhou	8
Total RETRACK – Lanzhou via TransSib – Trans Kazakh route	**27-28**

Source: RETRACK interviews, Yusen Logistics, January 2012, and IRS, February 2012

Table 32: Lead time for container bloc trains on the TransSib – Trans Kazakh route

Train connections (examples)	Distance, km	Duration, days	Notes/ Source
Berlin – Moscow	1,107	4,5	Transcontainer[76]
Berlin – Moscow	n/a	3,5	Ostwind[77]
Krasnoe – Petropavlovsk	3,012	4	Transcontainer[78]
Mocsow – Dostyk	5,377	7	JICA Study, 2005
Dostyk – Urumqi	496	1	JICA Study, 2005
Dostyk – Lianyungang	n/a	5	Block train; RETRACK Interview
Duisburg-Chongquing	n/a	16	Via Petropavlovskm RZD[79]
Duisburg-Shanghai	n/a	25	RZD/DB, 2008[80]
Berlin – Shanghai	1,1073	16,6	via Ozynki, optimised time frame/priorties, RZD/DB, 2008[81]
Cherkessk-Chongquing	9,590	14	via Ozinki / Ilezk http://www.gudok.ru/1520/
Moscow –Shanghai	9,877	14	JICA Study, 2005
Lead time for block trains on TransSib – Trans Kazakh route	**Distance, km**	**Duration, days**	**Consultants assessment, 2011**
Duisburg – Moscow	2,363	5	
Moscow -Petropavlovsk	2,443	3	
Petropavlovsk – Dostyk	1,910	5	
Dostyk – Lanzhou	2,402,3	5	
Total: Duisburg – Lanzhou	**9,118**	**18**	

76 http://www.trcont.ru/?id=18&L=0, 10.01.2012.

77 Belarussian Railways company brochure, 2011

78 http://www.trcont.ru/?id=18&L=0, 10.01.2012.

79 http://www.rzd-partner.ru/news/2011/11/11/371249.html, 9.12.2011.

80 RZD/DB Presentation "Combined Transport from and to East Europe and beyond to China – the potentials of the railways", 2008.

81 Idem

The creation of the Customs Union of the Russian Federation, Kazakhstan and Belarus gives additional advantages to the TransSib-Kazakh route. Users recognise that customs clearance no longer is a bottleneck at the "internal borders" of the Customs Union, i.e. the borders between Belarus and Russia and between Russia and Kazakhstan.

Tables 33 and 34 present the lead time for the container transport by single wagon loads and block trains for the TransSib – Mongolian route.

Table 33: Duisburg – Lanzhou transit time for the container transport by single wagon load traffic via TransSib – Mongolian route

RETRACK corridor section	Days, +/-
Duisburg – Malaszewicze	5
Reforwarding Malaszewicze – Brest	1
Brest - Moscow – Yekaterinburg – Tymen – Omsk – Novossibirsk – Krasnoyarsk – Irkutsk – Ulan-Ude – Zaudinskiy – Naushki	20
Suhe Bator – Zamyn Uud – Erenhot – Jining – Beijing – Lanzhou	12
Total RETRACK – Lanzhou via TransSib – Trans Kazakh route	**38**

Source: RETRACK interviews, Yusen Logistics, January 2012, and IRS, February 2012

Table 34: Lead time for container bloc trains on the TransSib-Mongolian route

Train connections (examples)	Distance, km	Duration, days	Notes/Source
Brest – Naushki	n/a	8	Transcontainer[82]
Beijing – Erenhot	863	1-2	Block train, RETRACKInterview
Berlin – Beijing	9,670	15.5	via Naushki, RZD/DB, 2008[83]
Antwerpen – Shanghai	n/a	30	Hazardous goods carriage, HUPAC[84]
Zamyn Uud - Tianjin	n/a	3	UNESCAP case study
Lead time for block trains on TransSib – Mongolian route			**Consultants assessment, 2011**
Duisburg – Moscow	2,363	5	
Moscow – Naushki	5,897	7	
Naushki – Erenhot	1,123	3	
Erenhot - Lanzhou	2,645	7	
Total: Duisburg – Lanzhou	**12,028**	**22**	

Tables 35 and 36 present the lead time for the container transport on the single wagon loads and block trains for the TransSib – Manchurian route.

82 http://www.trcont.ru/?id=18&L=0, 10.01.2012.

83 RZD/DB Presentation "Combined Transport from and to East Europe and beyond to China – the potentials of the railways", 2008.

84 http://www.bahnonline.ch/wp/36852/bertschi-hupac-iso-tankcontainer-landbruecke-antwerpen-shanghai-china.htm, message from 5.08.2011, 9.12.2011.

Table 35: Duisburg – Lanzhou transit time for the container transport by single wagon load traffic via TransSib – Manchurian route

RETRACK corridor section	Days, +/-
Duisburg – Malaszewicze	5
Reforwarding Malaszewicze – Brest	1
Brest - Moscow – Yekaterinburg – Tymen – Omsk – Novossibirsk – Krasnoyarsk – Irkutsk – Ulan-Ude – Zaudinskiy – Naushki	21
Suhe Bator – Zamyn Uud – Erenhot – Jining – Beijing – Lanzhou	12
Total RETRACK – Lanzhou via TransSib – Trans Kazakh route	**39**

Source: RETRACK interviews, Yusen Logistics, January 2012, and IRS, February 2012

Table 36: Lead time for container bloc trains on the TransSib-Manchurian route

Train connections (examples)	Distance, km	Duration, days	Notes/Source
Moscow – Zabaykalsk	6,659	12	CCTT[85]
Moscow – Zabaykalsk		7,5	Transcontainer[86]
Berlin – Changchun	9,905	13,5	Optimised lead /service time, RZD/DB, 2008[87]
Neustraubing -Shenyang	11,000	18	Automotive parts, e.g. for BMW, Transcontainer,[88]
Hamburg - Shanghai	n/a	18	TEL[89]
Duisburg - Shanghai	n/a	22	RZD/DB, 2008[90]
Leipzig - Shenyang	n/a	23	DB Schenker[91]
Moscow - Tianjin	n/a	21	FESCO[92]
Lead time for block trains on TransSib – Manchurian route			**Consultants assessment, 2011**
Duisburg – Moscow	2,363	5	
Moscow – Zabaykalsk	6,659	7	
Zabaykalsk - Lanzhou	4,033	10	
Total: Duisburg - Lanzhou	**13,055**	**22**	

85 www.transsibcouncil.com, 9.12.2011

86 http://www.trcont.ru/?id=18&L=0, 10.01.2012.

87 RZD/DB Presentation "Combined Transport from and to East Europe and beyond to China – the potentials of the railways", 2008.

88 JCS Transcontainer Presentation, CCTT 20th Plenary Meeting, Odessa, 28.-29.09.2011

89 TEL Trans Eurasia Express company brochure

90 RZD/DB Presentation "Combined Transport from and to East Europe and beyond to China – the potentials of the railways", 2008.

91 DVZ German Logistic Journal, article from 29.09.2011. http://www.dvz.de/news/logistik/artikel/id/bmw-laesst-teile-per-zug-nach-china-transportieren.html

92 http://www.fesco.ru/en/clients/container/cross-border/frs/, 10.01.2012

While the lead time reflects the foreseeable risk and weaknesses according to the most recent experiences, there is neither a liability nor a performance guarantee of public authorities and institutions to comply with processing time and hence lead time requirements or expectations. Furthermore, the potential for delays due to the possible errors caused by failures in filling in all forms and documents according to required national standards increases when different national language requirements have to be complied with.

Prices

Tariff rates for the domestic and export/import international transportation on the Russian railway network are regulated by the State Tariff Committee of RF. Transit rates are regulated by the Ministry of Transport. The new container train tariff consisting of 3 components – traction, axle number and gross weight of containers, was introduced in 2011.[93] The market price for the 20' container transport (single wagon load traffic) on the studied TransSib routes are represented in Tables 37-39.

Table 37: Market price for 20' container transport (single wagon load) from Duisburg – Lanzhou via TransSib – Trans Kazakh route

Weight	Europe (EUR)	Ukraine (USD)	Russia (USD)	Convoy (USD)	Kazakhstan (USD)	China (USD)	Total (USD)
20'<8 tonne	646	558	1,070	90	870	3,200	6,640
20'<16,5 tonne	713	558	1,070	90	870	3,200	6,730
20'<22 tonne	825	558	1,070	90	870	3,200	6,877
20'<24 tonne	1,015	558	1,070	90	870	3,200	7,128

Source: RETRACK interviews, Yusen Logistics, January 2012

Table 38: Market price for 20' container transport (single wagon load) from Duisburg – Lanzhou via TransSib – Mongolian route

Weight	Europe (EUR)	Ukraine (USD)	Russia (USD)	Convoy (USD)	Mongolia (USD)	China (USD)	Total (USD)
20'<8 tonne	646	558	1,475	330	800	2,600	6,616
20'<16,5 tonne	713	558	1,475	330	800	2,600	6,705
20'<22 tonne	825	558	1,475	330	800	2,600	6,852
20'<24 tonne	1,015	558	1,475	330	800	2,600	7,103

Source: RETRACK interviews, Yusen Logistics, January 2012

Table 39: Market price for 20' container transport (single wagon load) from Duisburg – Lanzhou via TransSib – Manchurian route

Weight	Europe (EUR)	Ukraine (USD)	Russia (USD)	Convoy (USD)	China (USD)	Total (USD)	
20'<8 tonne	646	558	1,475	330	3,400	6,615	
20'<16,5 tonne	713	558	1,475	330	3,400	6,705	
20'<22 tonne	825	558	1,475	330	3,400	6,852	
20'<24 tonne	1,015	558	1,475	330	3,400	7,103	

Source: RETRACK interviews, Yusen Logistics, January 2012

93 RZD Presentation, NEA & CCTT Business Forum, Haag, 18-19.05.2011

According to the information from CCTT[94], the tariffs on transit transportation along the Russian railways in 2008 considered the imbalance of freight flows on routes going East-West (USD 900 per loaded 40 TEU container), and West-East (USD 800 per loaded 40 TEU container and USD 400 per empty 40 TEU container). This was because more wagons were transported laden West-East than East-West. The tariff now aims to stimulate additional laden traffic East – West.

The sales price the container operators offer their clients differs from this due to currency exchange fluctuations (CHF, USD, Russian Rubel, Euro) and to the production system (single wagon load, block train).

It should be noted that according to the official railway tariff policy a discount of 10 % on the freight rates for single wagon loads is given in the case of booking block trains. Other factors influencing the actual market price are the employment of private wagons (15% discount) and further rebates depending on volume and fees for coordination and administration.

The literature review and interviews provide some indications as to market prices for the container transport via different TransSib routes, which are summarised in Table 40.

Table 40: Average market prices for container transport via TransSib

Route	Price per 20 ft container	Notes/Source
1. TransSib - Kazakh Route		
Duisburg – Shanghai	4,500 $	RZD/DB, 2008[95]
Brest – Urumqi	2,559 €	JICA Study, 2005
Duisburg – Lanzhou	3,300 $	Consultant assessment
2. TransSib - Mongolian Route		
Rotterdam –Erlian	4,000$	RZD/DB, 2008
Duisburg – Lanzhou	4,700 $	Consultant assessment
3. TransSib - Manchurian Route		
Duisburg –Shanghai	4,000$-4,500$	RZD/DB, 2008
Duisburg – Lanzhou	4,600 $	Consultant assessment

The following table compares costs and freight between the single wagon loads and block trains systems.

94 http://www.transsibcouncil.com/en/index.news.rzd_partner_int1.html

95 RZD/DB Presentation "Combined Transport from and to East Europe and beyond to China – the potentials of the railways", 2008.

Table 41: Comparison of Freight Costs and Lead Times for one 20' - Container (< 16.5 tons) from Duisburg to Lanzhou

Route	Single Waggon Load		Block Train	
	USD	Days	USD	Days
TransSib-Kazakh route	6,730	28	3,200	18
TransSib-Mogolian route	6,705	38	4,700	22
TransSib -Manchurian route	6,705	39	4,600	20

Source: Freight tariff quotation for single waggon loads; consultants assessment for block trains based on market prices 2011.

The block train parameters are based on an assessment according to market prices. This comparison shows the clear advantages of block trains in terms of cost and time. The production system of block trains is more efficient than the single wagon load production system because there is no need for shunting, border crossing is facilitated and train assembly and dispatch is faster. Very often block trains benefit from a preferential clearance at border crossing stations and in transshipment terminals on account of single wagon loads which have to wait even longer.

This is due to the management attention and the political support block train concepts may enjoy. Indeed block trains from /to industrial sites in Northern China would promote industrialisation because of good supply chain connections to/from Europe. The Chinese regional and municipal administrations support these concepts in order to create workplaces or to avoid shifting work places to the Chinese port regions.

Frequency of service

All routes are highly dependent on the available capacity of the Trans-Siberian railway. Therefore, below we describe the current traffic volume on TransSib and the available capacity for the new services along it.

The Trans-Siberian Railway capacity is at present 360,000 TEU (2010) and an extension to 1 million TEU per year is possible. The comparatively high capacity of trains on the Trans-Sib is seen as an advantage. Every train on the TransSib consists of 57 wagons, each transporting two 40'-containers. That is equivalent to 228 TEU per train.

The total volume of international traffic on the TransSib amounted to nearly 70 million tonnes during the first 8 months of 2011 and has increased by 0.8% compared to the same period in 2010[96]. Ninety-three perecent of the entire traffic is the export from Russia. The share of transit on TransSib is minimal (Table 42).

96 Presentation of Freight One JSC at the CCTT 20th Plenary Meeting. Odessa, 28.-29.09.2011

Table 42: TransSib traffic volumes

	Volume, tonnes, First 8 months 2011	Share	Change compared to 2010
Total	70 mln	100%	+0,8 %
Export from RF	64,5 mln	93%	-0,4%
Export to RF	4,3 mln	6,5%	+25,1%
Transit	343,000	0,5 %	-16,2%

Source: Freight One OJSC, Presentation on the 20th CCTT Plenary Meeting. Odessa, 28-29.10.2011

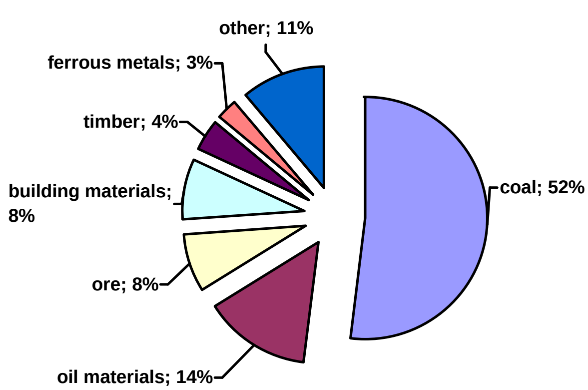
The dominating types of wagons of the TransSib traffic are open and tank cars (see Table 43).

Table 43: Summary of the wagon types used on the TransSib

Type of wagon	Eastbound, T. wagons	Westbound, T. wagons	Return loading, %
Open cars	565	20	4
Tank wagons	265	0,2	0
Flat wagons	104	2	2
Covered wagons	31	11	35-
Mineral wagons	20	3	15

The traffic volume in the direction West - East versus West – East on the TransSib is non-balanced. The main stream of loaded wagons passes from West to East (996,000 wagons), while only 5% of this volume runs in the opposite direction. This is caused by the structure of the traffic along the TransSib and the structure of Russia's foreign trade. The transportation of coal from Kuzbass to the Far Eastern ports forms the main loaded freight stream on the TransSib. The other important types of cargo on the TransSib are oil, ore cargo, building materials and timber (Figure 14).

Figure 14: Types of cargo prevailing on the TransSib



Source: Freight Two OJSC, Presentation on the 20th CCTT Plenary Meeting. Odessa, 28-29.10.2011

The high share of the empty wagons causes increasing transport costs for the customers.

Table 44: Volume of loaded traffic on TransSib, allocation to border crossing stations

Direction	Volume, in thousand of wagons via:				
	Zabaykalsk	Naushki	Grodekowo	Far East ports	**Total**
Eastbound	173	35	73	715	**996**
Westbound	13	7	6	26	**53**
Return loading	8%	20%	8%	4%	**5%**

Source: Freight Two OJSC, Presentation at the 20th CCTT Plenary Meeting. Odessa, 28-29.2011

The Zabaykalsk border crossing station at the Chinese border (TransSib-Manchurian route) is utilised more than the Naushki border crossing station at the Mongolian border (Transsib-Mongolian route). Of the loaded freight on TransSib, 17,4% (corresponds to 173,000 wagons) passes Eastbound via Zabaykalsk and 1,5% (corresponds to 35,000 wagons) via Naushki. The loaded freight Westbound amounts to 13,000 wagons via Zabaykalsk and 7,000 wagons via Naushki (Table 44).

The total volume of the international container traffic along the TransSib amounted to 364,002 TEU in 2010, of which 32,415 TEU accounted for transit (Table 45).

Table 45: The total volume of container traffic on the TransSib, international

	2010, TEU	Change compared to 2009, in %	First quarter 2011, TEU	change compared to 2010, in %
Total	364,002	+36	105,737	+59
Import to Russia	189,540	+61	550,63	+90
Export to Russia	142,048	+8	42,360	+29
Transit	32,415	+80	8,314	+82

Source: RETRACK Interview, Russian logistic experts, December 2011

For the first half of 2011, traffic volumes of high capacity containers through the TransSib grew by 31%, in comparison with the same period in 2010.

According to the information from the CCTT, TransSib is capable of transporting up to 130 million tonnes of cargo per year, including about 500,000 – 600,000 containers for the import/export of cargo and 250,000–300,000 containers for transit. The total volume of the international container traffic on the TransSib amounted to 364,002 TEU in 2010, of which 142,048 accounted for the export from the RF, 189,540 for import to the RF and only 32,415 TEU for transit. The total volume of international traffic on the TransSib in general amounted to nearly 70 million tonnes during the first 8 months of 2011 and has increased by 0.8%, compared to the same period in 2010. Ninety-three perecent of the entire traffic is the export from Russia, while the share of transit on TransSib remains minimal. The traffic West - East - West on the TransSib is thereby highly imbalanced. The main stream of loaded wagons passes from West to East, however, in the opposite direction, traffic accounts only for 5% thereof. This is due to the structure of traffic on the TransSib and the structure of Russia's foreign trade.

The coal transportation from Kuzbass to the Far Eastern ports forms the main loaded freight stream on TransSib. The RZD plans to modernise the Baikal-Amur Mainline so that it can gradually take over bulk freight from TransSib. This will help to free up the TransSib and improve its operational conditions.

The literature review and interviews provide further indications towards the frequency of the established container transport services between Europe and PRC. These are represented in the Table 46. Some of the train operators specified in the following table provide regular services. Furthermore, the table includes pilot trains, which have been recently launched with the perspective to launch a regular service in 2012.

The Transsiberian Railway capacity is at present 360,000 TEU (2010). An extension to 1 million TEU per year is possible. The comparatively high capacity of trains on the Transsib is seen as an advantage. Every train on the Transsib consists of 57 waggons, each transporting two 40'-containers. That is equivalent to 228 TEU per train.

Table 46: Container transport services between Europe and China

Train connections	Frequency	Operator	Service started	Duration, days	Remarks
Neutraubling Shenyang	Pilot train, 5 times a week perspectively	Transcontainer	2010	18	BMW spare parts
Leipzig - Shenyang	4 pilot trains, from November 2011 daily	DB Schenker Rail Automotive	2011	23	via Zabaykalsk, BMW spare parts
Duisburg - Chongquing	Weekly (7 times a week perspectively)	Transcontainer, TEL	2011	20-25	via Ilezk, Brest (not using Transsib)
Großbeeren – Moscow (Ostwind)	4 times a week	InterRail Services TEL	2006	3,4	futher connection to Kazakhstan/PRC possible
Brest - Erlian (Mongolian Vektor)	Twice a month	Transcontainer, Belintertrans	2005	8	futher connection to PRC possible
Brest – Arys (Kazakhstan Vektot)	on demand	Transcontainer, Belintertrans	Since 2008	3,5	via Ozinki or Ilezk, Brest (not using Transsib)
Cherkessk-Chongquing	1 pilot train (7 trains in 2008)	Transcontainer, Kaztransservice, CRIMT	2011	14	Via Ozinki, car spare parts

One of the important issues that has an impact on the frequency of services is the lack of spare capacity along the route and possible capacity bottlenecks.

The Zabaykalsk border crossing station at the Chinese border is utilised more than the Naushki border crossing station at the Mongolian border (on the route 2). Of the loaded freight on TransSib, 17,4% (corresponds to 173,000 wagons) passes Eastbound via Zabaykalsk and 1,5% (corresponds to 35,000 wagons) via Naushki. The loaded freight Westbound amounts to 13,000 wagons via Zabaykalsk and 7,000 wagons via Naushki.

The frequency of service on the Mongolian route is also impacted by the throughput capacity between stations in Naushki and Ulan-Bator which is 14-15 pairs of trains per day and between border stations Zamyn Uud and Erenhot - 12 pairs of trains. In fact, only four pairs of trains per day cross the Russian border and nine pairs of trains per day cross the Chinese border.[97] So there is enough capacity for more trains.

Damages and Theft

The RZD has invested about 2.7 billion rouble to implement the Programme of the Traffic Safety Improvement. In 2010, more than 1,9 thousand acts of unlawful interference with rail transport were registered in Russia. However, most of interviewees within the survey consider the problem of theft to be less acute.

5.3.2 Major risks along the corridors

Interviews with users of the TransSib corridor have indicated the following problematic areas, which affect the overall corridor performance.

Risks of unfair competition on the TransSib corridor (for all routes).

The Russian rail market (including TransSib) is still in control of the RZD and its affiliates. Private, third operators or carriers have to use monopolistic structures which results in disadvantages because of monopolistic pricing which may result in additional disadvantages (priorities given to RZD companies, lack of available platforms etc.). Preference schemes for dedicated trains or cooperation schemes under the RZD Transcontainer involvement may result in indirect discrimination of other operators due to a limited number of time slots, track and facilities. This results in operational discrimination. Continuous and step-by-step progress could be made by the Russian side to tackle this risk. The split of RZD into different companies and directorates made business more flexible and open, nevertheless, the principle division between infrastructure and operation and free access is still to be aimed for.

Private container train operators expressed their preference to use the TransSib-Kazakh and TransSib-Mongolian routes instead of the TransSib-Manchuarian route via Zabaykalsk. The border crossing and container transshipment facilities at Zabaykalsk are the property of Transcontainer (RZD affiliated company) and hence non- affiliated

[97] http://www.gudok.ru/services/search/?q=%ED%E0%F3%F8%EA%E8&where=&how=d&from=&to=, 27.02.12

consortia or organisations refrain from handling at this station, due to the possible risk of disclosing sensitive commercial information to a competitor.

Risks of non-availability of platform wagons for container transport (for all routes).

The interviewed counterparts reported a frequent lack of availability in platform wagons for container transport on the route from Europe to/from the Chinese border. In former times a wagon pool of all state owned railways was in operation which allowed interchanges between different railways and one-way use of wagons. The split off of legally privatised RZD affiliates as new rolling stock owners (e.g. First FreightCompany) has changed the market situation for private container train operators. Whereas in a few cases the old system still applies, (e.g. for platform wagons of Belarussian-Russian railways) the majority of platform wagons is now being considered by the state owned railways as "private cars". This results in higher costs (because of costs for empty return voyage, higher coordination costs) and in possible discrimination due to the preference to provide wagons to RZD affiliated companies.

This risk can be solved through stronger participation of private investments into rolling stock and the expansion of private wagon leasing companies. The RZD daughter company for rolling stock Freight One Company JSCO has already been partly privatised and other private industrial railways try to expand their business from internal industrial railway operation (e.g. in steelworks) to long distance transport, including the operation and leasing of their own private railcars.

Risks of delays at border crossing stations (on TransSib-Kazakh route) and related transshipment.

There is a risk of delays at the border crossing terminal at Dostyk on the Kazakh/Chinese border. An expansion programme is currently underway to reduce this risk in the future.

Risks of unpunctuality (on all routes).

In the case of single wagon loads and wagon groups there is a risk of unpredictable transport times and unpunctuality along this long route. The consolidation of trains and shunting operations and marshalling yards frequently results in waiting times for single wagons or wagon groups. This risk can be minimised by establishing block train services which run on a fixed timetable. These trains are not broken up during the transit and monitoring and control is easier.

Risks related to different administrative rules and documentation requirements (on all routes).

Due to the different national rules of different railway conventions applicable (SMGS and COTIF) and because of different languages, there is the risk of delays and of additional costs because of friction in commercial and administrative procedures.

The solutions for this risk are the harmonisation of legal regulations and requirements, as well as the use of modern ICT solutions.

With regards to freight documents, the introduction of a uniform CIM-SMGS consignment note was a big step forward in this direction. This CIM-SMGS consignment note is applicable in Europe, Russia (all routes), Kazakhstan and Mongolia. Discussions with China (which is a member of the OSShD) to apply this note are considered to be positive. At present 20,000 deliveries per year are using this waybill and it can be used for other deliveries as well.[98] In comparison to re-expedition (filling in new waybill) the application of the CIM-SMGS consignment note saves 40 Euro per waybill or 2,000 Euro per train[99]. The CIM/SMGS consignment note allows the reduction of the total freight delivery time by an average of 8 – 12 hours. It is recognised as a customs and bank document. There are software applications available to electronically fill in the consignment note, print it and transmit data.

The advantages of the new consignment note are: shorter transit times by reducing the time spent at CIM/SMGS re-expedition points, elimination of extra costs and transcription errors, which can result from the rewriting of consignment notes.

A further step is the electronic transfer of e-consignment notes and of the accompanying documents. The container train “Eastwind” serves as a pilot for this application.

In regards to customs clearance counterparts reported occasional difficulties in this area.

One reason may the inaccurate declaration which may be caused by the different Customs Codes in the EU (8 digits code) and in the customs union of Belarus, the Russian Federation and Kazakhstan (10 digits code). In addition to possible future harmonisation of Custom Codes and implementation of electronic customs declarations, it should be questioned why customs inspects transit containers at all.[100]

Customs procedures within the customs union of Belarus, Kazakhstan and Russia do not cause unexpected delays, provided that documents are accurate and in full compliance with the required standards. Respondents pointed out that the duration of the customs clearance depends on commodity types. Customs documentation and cargo inspection issues at the Western part of the EU borders were considered to be more cumbersome by counterparts, than the proceedings at the Chinese border.

Risks of non-competitive and tariffs fluctuations or sudden tarrif adjustments.

As mentioned above, the segmented tariff policy of the railway administrations involved may cause higher and therefore, non competitive prices. In addition, steady tariff fluctuations hamper long term logistics service contracts when using the TransSib route. Sea transport as a competitor offers a much more flexible pricing. Although surcharges may be announced on short notice to the public, individual and tailor made service contracts between shippers and carriers guarantees fixed and market conform rates and service levels.

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98 Levitin, I.E. (Minister of Transport of RF).- statement at CCT 20th plenary meeting.-Odessa, September 28 2012

99 Evitmov, E. (legal expert CIT).-statement at CCT 20th plenary meeting.-Odessa, September 29 2012

On the TransSib routes pricing is still inflexible and slowly reacts to market changes. The deregulation of tariffs along the TransSib route is necessary and supported by the RZD in their statements.[101]

The imbalance of rail cargo flows of containers is a further obstacle.

Most cargo runs from Europe to Central Asia and Russia or between Central Asian countries and the People's Republic of China, while there is not yet much transit traffic between the European Union – PR China.

5.4 Operational and technical barriers along the TransSib corridor

5.4.1 Technical barriers

The RETRACK extension to Russia and China via the TransSib rail corridor involves several countries (five or six, depending on the corridor option) with partly different technical railway standards. These are considered as challenges for the effective transport organisation.

The RZD has been implementing a number of actions to overcome the risks mentioned above and to achieve the organisational and technological improvements on the TransSib .

In regards to the TransSib and TransSib Kazakh routes, it should be noted that the electrification of missing links along the Kazakh route and the expansion of the transshipment capacities at Dostyk are technical barriers which need to be improved.

In regards to the TransSib-Mongolian route there are the issues of technical barriers of single, non electrified tracks on the Russian branch route and on the Mongolian routes. A track extension and electrification programme should be assessed in order to evaluate the economic feasibility of a capacity improvement on this route.

5.4.2 Operational barriers

Availability of wagons and wagon dispositioning

For container operators which use wagons in single wagon traffic there is the problem of the availability of wagons and of their availability for the right type at the right time and in the right place (logistics). Wagons for public use are available less and less since the RZD has been outsourcing the rolling stock to daughter companies. Wagons that belong to these companies are considered to be private wagons which must be returned to the owner at a designated place (e.g. in Moscow).

This results in empty voyages and additional costs while wagons of the state railways (like of Belarussian Railways) have to be sent back to the origin within 30 days. These state railwaywagons can be re-loaded on the return voyage and used by others. In

101 Yakunin, V.I. (President of RZD).- statement at CCT 20th plenary meeting.-Odessa, September 28 2012

practice, this means that the container operator can return the wagon at the Russian/Chinese or Kazakh/Chinese border.

Container operators with their own railcars (e.g. Transcontainer) give priority to their own transports, whereas asset free operators do not have sufficient access to railcars. A market for renting private railcars is not fully functional. Therefore, private train operators work on strategies on how to build up a wagon park.

The problem of availability of wagons is eased in the case of block trains which run on a fixed schedule as shuttle trains do.

Availability and dispositioning of containers

Whereas the problem of wagons may be solved in the near future, the problem of availability of containers is even more complex and complicated. The ISO-container originates from sea transport. In sea transport, shipping lines as carriers have built up and optimised their container parks over the last 40 years. They own by far the majority of ISO containers. Since it is not their primary interest to send their sea containers via rail, the container operators have to build up their own container parks and even more important, they have to build up a container logistics with a monitoring and depot network which at present, does not exist at a sufficient level.

At present the low amount of container transport on rail via the TransSib can be solved by rail owned or shipper owned containers. However, if the volume increases this barrier will become crucial.

Flow of information

Each of the studied routes is a multi-country corridor and requires a multiple border crossing. Every border crossing cause an additional waiting time and an increase in the lead time of the transport.

The next instrument to allow simplification of the border crossing procedure and to reduce the waiting time, is the application of the system of pre-electronic declaration. Preliminary information technology is already implemented in Zabaykalsk and allows the the waiting time at the border to be reduced by 1,5 days. [102]

CCTT is working on an innovative non-commercial pilot transport project “Electronic train”. It will provide the operation of international freight trains in West –East direction and vice versa using electronic transport documents. The “Electronic train” project will be implemented on the basis of the container train “Ostwind” and will arrange a preliminary transfer of electronic documents to the transportation participants. The first phase of the project focuses on organising electronic and legally significant document workflow with the use of electronic digital signatures. This includes measures on mutual recognition of digital signatures by all participants. In the second stage, the plan is to develop and implement a new train schedule for the involved parties in the project trains, in order to expedite the train processing at border stations by means of electronic document circulation.[103]

[102] Presentation of the Transcontainer in Odessa, 2011

[103] Capital Express 2011, S.16

Training and human resources development
As an additional barrier the human resource aspect should be considered, given the age of the present railway operating staff and the need of re-staffing due to retirement. There is potential for improvement of the operational management and of engine and wagon and staff allocation planning and management. Shift planning and shift change processes along the TransSib corridor bear potential for acceleration of transit times. The captioned issues are addressed by the RZD senior management and by the RZD shareholder. According to the technical and operational improvements achieved, measures were successfully implemented and further steps are on the management agenda in order to achieve further improvements.

5.5 Summary of the TransSib corridor potential for RETRACK

Three TransSib routes have a common section from Moscow to Yekaterinburg. From Yekaterinburg onwards there are three options: going via Petropavlovsk to Kazakhtsan and further China, going to China via Mongolia and directly crossing the border with China following the route until Zabaykalsk. The average speed depends on the corridor. On the main TransSib line it is 76 km per hour and is quite high. Due to the different power supply systems in Russia, it is necessary to change locomotives several times. The main technical and operational characteristics of the TransSib corridor are summarised in Table 47.

Table 47: Summary of technical and operational characteristics of the TransSib corridor

Route	TransSib – Kazakh	TransSib - Mongolian	TransSib - Manchurian
Distance, km	4,353	7,021	6,660
Double track, km	3,514	5,654	6,442,4
Electrified, km	3,514	5,649	6,442,4
Electrification system	3KV DC; 50kV AC 50Hz, not electrified sections	3KV DC; 50kV AC 50Hz, not electrified sections	3KV DC; 50kV AC 50Hz, not electrified sections
Gauge	1,520	1,520	1,520
Maximal axel load on the railway section (T)	25/23	25	25
Max train length (m)	1,000	1,000	1,000
Max train mass (T)	2,800	2,800	2,800
Loading gauge	T, 1-T	T, 1-T	T, 1-T

The strengths and weaknesses of the routes using TransSib are described from the view of the (potential) customers. The following criteria are taken into consideration:

- Price differs from €2,500 to €3,500 depending the the routes and destinations.
- Lead time from Moscow to the border crossing with China differs slightly for the three studied routes. It is estimated that the distance from Moscow to Dostyk via the TransSib – Kazakh route can be covered by a block train in 8 days; using the TransSib – Mongolian route (until Erenhot) in 10 days, finally with the TranSib –

Manchurian route (until Zabaykalsk) – 7 days. The lead time also differs for the single wagon load trains.

- Frequency of service for container block trains differs greatly, depending on the different operators and from daily services to twice a month. In general, there is enough spare capacity to introduce new services on all of the routes.
- Shipment compatibility is an asset for this route, as the route mainly passes railways having the same technical requirements, such as gauge, safety systems, etc. Only at the EC border and the Chinese border do these requirements change.

TransSib corridor offers clear advantages in comparison with other routes, including sea transport. First of all, it has high potentiall technical capabilities: the Transsiberian Railway capacity is at present 360,000 TEU (2010). An extension to 1 million TEU per year is possible. Additioanlly, the comparatively high capacity of trains on the Transsib is seen as an advantage. Every train on the Transsib consists of 57 waggons, each transporting two 40'-containers. That is equivalent to 228 TEU per train.

According to the Russian Action Plan for the development of the Transsiberian Railway the Russian government aims to increase average speed to 50 km/h and to reduce the transit time on Russian territory from 10 days (present) to 7 days[104]. Forwarders and container operators from Germany, Lithuania, Poland, Russia and Switzerland using this route expressed their optimism into the continuous improvements of this corridor and are developing rail connections on this route with increasing success.

Secondly, the corridor offers time advantage for high value cargo. In comparison to sea transport the rail transport from China to Europe via Transsib offers lower transit time at a higher price. The price level (index) from Shanghai/Bejing to Moscow is sea freight to rail freight as 3 to 5[105]. The lead times (days) terminal to terminal from Shanghai/Bejing to Moscow are sea freight / rail freight as 33-40 days to 10-12 days[106]. Therefore the TransSib route is able to serve a niche market for high value and time sensitive cargo originating or destined from / for Chinese inland places, preferably in the Northern parts of China.

Finally, TransSib offers an alternative solution for non-time sensitive wagon loads (e.g. heavy loads and chemicals). Heavy loads and out of gauge as well as dangerous cargo are not well suited to be transported in cellular container ships. Here the connection from China to Europe via TransSib offers an alternative solution. Tank wagons, single container wagons and general cargo wagons are transported usually as wagon loads from point to point and between railway nodes en route in block trains or groups. For instance highly dangerous sulphur cargo is transported from Kazakhstan to Germany by using Kazakh tank railcars on TransSib and ferry connection St.Petersburg-Sassnitz. On the German rail network these tank wagons are carried as out of gauge wagons.

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104 Statement of V.I. Yakunin (President of RZD) on CCT 20th Plenary Meeting.- Odessa, Sept.29, 2011

105 On-carriage from St.Petersburg by rail or road

106 TEE Trans Eurasia Express: ein neues Produkt zwischen Asien und Europa / Transportlösungen (Präsentation).- Trans Eurasia Logistics GmbH: Berlin, 2009

The major risks on the TransSib mainly concern the monopoly position of the Russian Railways. It is not possible to organise rail transport via Russia without involving the Russian Railways. The Russian Railways can misuse their position by increasing prices, limiting time slots, discouricing routes and by not opening all facilities to other operators.

Additional risks concern the lack of wagons. Not only is the total number of wagons unsufficient (and becoming outdated), but also the newly established rolling stock owners (such as Freight 1) make the wagons that are used sub-optimal, because each organisation organises its wagons, instead of there being one common wagon poule, as it used to be.

Further risks concern border crossings and customs, administrative rules and freight documents and fluctuating tariffs.

Technical barriers are mainly between the EU - Russia and Russia – China and concern the gauge, electrical systems, signalling systems, length of trains and the weather conditions.

Operational barriers are the distribution and availability of wagons, the lack of rail containers, the slow implementation of the pre-electronic declaration and the human factor which could be optimised.

6 The Central Corridor

The Central corridor is proposed in this deliverable as an alternative route through the territory of Kazakhstan to currently existing and functioning railway routes. It is discussed in more detail in this chapter.

6.1 Organisational model of the corridor

Nowadays, if cargo has to be delivered from Eastern Europe (e.g. Budapest, Bucharest RETRACK connectivity points) to Western China, the most common options which exist are:

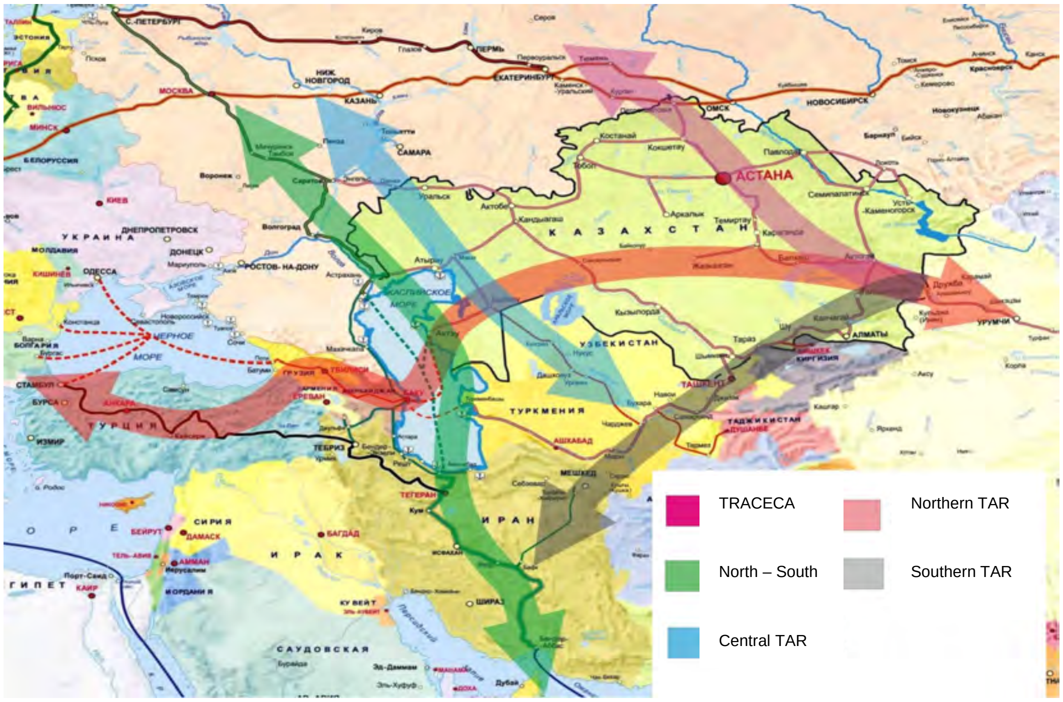
- road transport through Ukraine, Russia and Kazakhstan (e.g. different variations of Central NELTI route);
- container rail transport through Moscow and TransSib railway, or through Moscow and Kazakhstan via Ozinki/Iletsk station.

The railway infrastructure of Kazakhstan offers other options in connecting China and Europe. Some of them are already represented via international railway transport corridors in the territory of Kazakhstan:

1. Northern Corridor of Trans-Asiatic trunk-railway (TATR). The Northern Corridor passes through Western Europe – China, the Korean peninsula and Japan, Russia and Kazakhstan. Its Kazakh section of the route is Dostyk - Aktogai - Sayak - Mointy - Astana - Petropavlovsk (Presnogorkovskaya).
2. Southern Corridor of Trans-Asiatic trunk-railway (TATR). The Southern Corridor passes through the territories of South-Eastern Europe – China and South-East Asia through Turkey, Iran and Central Asia. Its Kazakh section of the route is Dostyk - Aktogai - Almaty - Shu - Arys - Saryagash.
3. TRACECA. The TRACECA corridor runs through the territories: Eastern Europe - Central Asia via the Black Sea, Caucasus and the Caspian Sea. Its Kazakh section of the route is: Dostyk - Almaty - Aktau.
4. North-South. The North-South Corridor is a link between Northern Europe and the Gulf countries through Russia, Central Asia and Iran. It runs in the territory of Kazakhstan in the areas of the seaport Aktau and Aktau – Atyrau section.
5. Central Corridor of Trans-Asiatic trunk-railway (TATR). The Central Corridor TATR is important to regional transit. Its Kazakh section of the route is Saryagash - Arys - Kandagach - Ozinki.

Map 6 illustrates these corridors. Table 48 further presents some characteristics of these corridors.

Map 6: International railway transport corridors in the territory of Kazakhstan



Source: Ministry of Transport and Communication of Republic of Kazakhstan

In addition, the CAREC corridors, EATL and OSJD corridors railway network run through the Kazakhstan territory. They are presented more in detail in Chapter 2 of this deliverable.

Table 48: Main national and international railway corridors through the territory of Kazakhstan

Corridor	Distance, km	Transport time on Kazakhstan territory, days	Volumes transported in 2007, th.tones	Volumes transported in 2008, th.tones
TRACECA – Aktau route (Dostyk – Aktau)	3,836	19	29,9	36,6
EATL: Aksaraiskaia – Oasis	832	4	824,4	906,8
Middle Asia corridor (Sariagash – Ozinki)	2,147	11	1,137	1,452,6
EATL Trans-Asian corridor, northern part (Dostyk – Petropavlovsk)	1,910	10	678,5	645,5
Trans – Asian corridor, central part (Dostyk – Sariagash)	1,831	9	1,299,8	1,833,3

Source: ATF Bank Research, Analytical paper, 12, 2010, p. 16

As we can see from Map 7, there is currently no corridor (supported by any international initiative) going from the East of Kazakhstan and its Chinese border to the West of the country and its border with Russia. At the same time, there are a few existing options:

- OSJD railway corridor 5k: Dostyk (KAZ) – Shimkent (KAZ) – Kandagash (KAZ) – Ozinki (KAZ) – Saratov (RF) – Balashov (RF) – Valuiki (RF) – Kiev (UKR) – Chop (UKR) – Budapest (HU)
- railway connection: Dostyk (KAZ) – Astana (KAZ) – Tobol (RF) – Ufa (RF) – Saratov (RF)
- railway connection: Dostyk (KAZ) – Almaty (KAZ) – Kandagash (KAZ) – Iletsk (RF) – Orenburg (RF)
- And others.

In the 1980s, before the turn-around in the CIS and CEE, another corridor – the railway route connecting the Eastern and Western part of the country through Dostyk (KAZ) – Almaty (KAZ) – Kandagash (KAZ) – Makat (KAZ) – Ganushkino (KZ) – Aksaralskaya (RF) was actively used for the Soviet Union – China trade. After the break-up of the Soviet Union this route ceased to exist and currently the complete corridor is used in a very limited scope. Some sections of the route continue to function and are used for inter-regional and bilateral trade.

Although it currently does not function as a corridor, this route represents one of the most interesting alternatives for the existing rail corridors and receives more and more attention from private operators. We will further study the case of the Central corridor, using this route as an example. Map 7 illustrates the Central corridor and its connections with RETRACK and China.

Map 7: Central corridor and its connections with RETRACK

6.2 Infrastructure assessment of the Central corridor

6.2.1 Technical and operational characteristics of the Central corridor route

Due to historic reasons the main railway lines in Kazakhstan were built in the direction of Moscow. The railway line Dostyk – Almaty – Kandagash – Makat – Ganushkino (KAZ) – Aksaralskaya (RF) forms one of the major lines which cross the country from East to West.

The main railway sections of the route are listed in the table below. These sections are parts of the internationally established railway corridors as well as main national lines.

Table 49: Characteristics of the Central corridor by railway segments

Central corridor segment	Main Kazakhstan railway lines	International corridors[107]
Dostyk – Actogay	Dostyk – Actogay – Mointi	TRACECA, CAREC 1b, OSJD 5j
Actogay – Almaty - Shikmet		TRACECA, CAREC 1b, CAREC 3, OSJD 5j
Shikmet - Kandagash	Actobe – Shimkent	Central Asian corridor, CAREC 1b, CAREC 6b,c, OSJD 5j
Kandagash - Makat	Nikeltau – Aksaralskaya	
Makat – Ganushkino/Aksaralskaya	Nikeltau – Aksaralskaya	TAR North-South corridor, CAREC 6a, OSJD 8; EATL

Technical characteristics of the Central corridor are listed in the table below.

Table 50: Technical characteristics of the Central corridor

Central corridor section	Distance, km	Double track, km	Electrified, km
Aksaralskaya II - Ganushkino	71,3	0	0
Ganushkino - Atyrau	243	0	0
Atyrau – Makat	127,5	0	0
Makat- Kandagash	396,1	2,1	0 (planned before 2018)
Kandagash – Shymkent *	1,492,7	487,5	52
Shymkent - Almaty **	738,4	738,4	738,4 with 25 kv50Hz
Almaty - Actogay **	556,8	0	0 (planned before 2019)
Actogay - Dostyk **	305	0	0 (planned before 2019)
Total	**3,930,8**	**1,228**	**790,4**

*Source: OSJD Rail transport corridor n 8, 2009; * OSJD Rail transport corridor n 5, 2008; ** OSJD Rail transport corridor n 10, 2010.*

The total distance of the corridor is 3,930.8 km, of which only 1,228 are double track. Currently 790 km are electrified, but before 2019, it is planned that about 1,260 km more will be electrified. Railway sections from Aksaralskaya to Kandagash have loading gauge T and further through Kazakhstan loading gauge 1-T. Wagon traction capacity differs by railway section.

[107] Not explicit

The railway gauge of the corridor is 1,520 mm. The maximum freight train speed varies from 60 to 80 km/h depending on the condition of the railway infrastructure. The maximum train mass is 2,800 – 3,200t and the maximum axel load on different sections of the route varies from 23 to 25 tonnes.

Kazakhstan realises the importance of the transport sector in general and the railway transport in particular and is currently implementing a Transport Strategy up until 2015. Located astride many of the historic trade routes between Europe, Eastern and South-Eastern Asia, Kazakhstan depends heavily on its transit potential to boost its own economy. The development of the transit potential through railway transport is also a part of the national strategy. In the framework of this transport strategy it is foreseen to build 436 km of new railway routes and electrify 392 km of existing ones[108].

The main goal of the national transport strategy is to connect industrial regions within a country and to improve railway lines of strategic importance. As the Central corridor is not considered as a priority, the strategy does not provide any direct support to its promotion or development. Nevertheless, some sections of the corridor benefit from the established national priority projects:

- Modernisation and electrification of the railway lines Makat – Kandahash (394,8 km) before 2018;
- Modernisation and electrification of the railway line Almaty – Aktogai (556,6 km) before 2019;
- Construction of the railway line Jetigen – Khorgas(293 km) and provision of the new border crossing with China.

Additional priority projects, which are to be implemented after 2015, will also benefit the Central Corridor:

- Electrification of the lines Dostyk – Actogai and Actogai – Almaty (2017 – 2019);
- Electrification of the line Makat – Kandagash (2016-2018).

The planned construction of the railway lines Beyneu – Shalkar (2016-2020) and Saksaulskaya – Gezkazgan (2016-2020) can further contribute towards the development of the Central corridor, providing alternative East-West railway connections within a country.
Implementation of the aforementioned projects will also considerably shorten the Central corridor: e.g. construction of the Jetingen – Khorgos railway line will shorten the Central corridor to approximately 550 km, which in practical terms, is translated into almost 1,5 days of the train run.

[108] The Transport strategy of the Republic of Kazakhstan until 2015, Kazakhstan Ministy of Transport and Communications

The Central corridor also benefits from the development and modernisation of some international corridors:

- Before 2015 the Russian Federation plans to invest more than 67 billion roubles in the upgrade of the international corridor "North – South" of TAR, on the Russian territory. In this framework it is planned to electrify and upgrade the double track of the railway line Trubnaia – Aksaralskaya; equip the cross-border station Verhniy Baskunchak and conduct rehabilitation of the stations along the North-South corridor, extending the receiving and departure rail paths[109].
- Within the RZD Programme, "Programme of terminal and warehouse development of RZD", Saratov, Volgograd and Rostov are all considered as the promising transport – logistics centres.
- Within the CAREC programm of the ADB, assistance is provided to Kazakhstan by means of concrete infrastructure investment projects (e.g. electrification of Almaty – Actogai railway station), as well as by research and consultancy studies (e.g. development of an integrated transport model for road and railroad infrastructure for the rehabilitation of the Western Europe – Western PRC transit corridor).

6.2.2 Main terminals on the route

For each of the corridor sections, Table 51 presents the name and the type of the railway stations. There are three marshalling yards of national importance situated on the Central corridor: Kandyagash, Arys and Dostyk and two freight yards: Shimkent and Almaty I.

Table 51: Railway stations on the Central corridor

Railway section	Name of the station	Type of the station
Aksaralskaya - Ganushkino	Ganushkino	Siding[110]
Ganushkino - Atyrau	Atyrau	Siding
Atyrau - Makat	Makat	Siding
Makat - Djarly	Sagiz	Siding
Makat – Shubar Kudyk	Shubar Kudyk	Siding
Shubar Kudyk - Kandyagash	Kandyagash	Marshalling yard
Kandyagash - Turkestan	Turkestan	Siding
Turkestan – Arys I	Arys	Marshalling yard
Arys – Shimkent	Shimkent	Freight yard
Shimeken - Tjulkubass	Tjulkubass	Siding
Tjulkubass – Zjambil	Zjambil	Siding
Zjambil - Lugovaya	Lugovaya	Siding
Lugovaya – Almaty	Almaty I	Freight yard
Almaty – Actogay	Actogay	Siding
Actogay - Dostyk	Dostyk	Marshalling yard

Source: OSJD Rail transport corridor n 8, 2009; OSJD Rail transport corridor n 5, 2008

[109] Giprotranstei, OAO RZD, B437, 02.12.2010

[110] On siding stations marshalling and freight operation of the local scope takes place.

In Kazakhstan the freight yards have a hub function that collect and disperse all the wagons to a designated yard with shunting works. For the Central corridor, Ganushkino is an important station, as this is an official border – crossing station with the Russian border, as well as the Dostyk station for the Kazakhstan – China border. The re-distribution of cargo which is to go to other Central Asian countries (e.g. Tashkent) takes place at the Arys station.

Within the framework and development of its transit potential, Kazakhstan plans to build an efficient network of transport – logistics centres. Logistics complexes are planned for the cities such as Astana, Almaty, Aktau, Dostyk and other cities that are industrially developed. Today, eight major container terminals are situated on the Central corridor pass. They are described in detail in the Table 52.

Table 52: Main container terminals

Terminal	Operations	Containers handled	Handling capacity (TEU/day)	Storage capacity (TEU)	
				3t, 5t	20', 40'
Atyrau*	Loading/unloading	3t, 5t, 20', 40'	100	80	100
Actobe	Loading/unloading	3t, 5t, 20', 40'	70	815	200
Kyzyl - Orda	Loading/unloading	3t, 5t	50	50	
Shimkent	Loading/unloading	3t, 5t, 20'	100	150	120
Zjambil	Loading/unloading	3t, 5t, 20'	60	100	30
Almaty I	Loading/unloading	20', 40'	80		1,150
Almaty II	Loading/unloading	3t, 5t, 20', 40'	60	780	200
Dostyk	Loading/unloading	20', 40'	100	-	500

Source: OSJD Rail transport corridor n 8, 2009; OSJD Rail transport corridor n 5, 2008

Dostyk railway station is the most important of the Kazakh intermodal terminals because it provides the connection of the Central corridor, TRACECA rail routes and Trans-Asian route to China. Dostyk and Alashankou are 12,2 km apart (the border is 4 km from Dostyk and 8 km from Alashankou). The main operations performed at the Dostyk terminal are: the breaking – up and making-up of trains and performing the gauge change from 1,520 mm (Kazakh gauge) to 1,435 mm (Chinese gauge). During these operations customs clearance is also given. The wheel change works are carried out unilaterally at Dostyk station, as in Alashankou there are no wheel change facilities. The works to change wagons crossing the border are carried out by the recipient side.

Dostyk has 5 types of yards and 7 types of transshipment points. The JICA study (p 10 – 17) reports that some of the cargo handling equipment at the station requires overall repair and the equipment does not match the current cargo volume. In 2009 the Dostyk rail freight terminal was capable of handling a maximum of 620 rail cars per day[111]. The actual cargo handling amount of the Dostyk Station is already 80 – 90% of its overall capacity. As some of the reloading spots are situated in the open air, in the Winter the handling capacity of the terminal is lower, as handling works are impossible due to the snowfall or fierce winds. The survey conducted with the freight forwarders within the

[111] The Study for the project of the integrated logistics systems and marketing action plan for container transportation, JICA, December 2007, p. 3 - 10

JICA study has indicated that the shortage of reloading facilities is critical at Dostyk. The improvement of the Dostyk station facilities is currently in progress.

6.3 Strength and weaknesses: what potential clients thinks

6.3.1 Supply Chain Requirements for the Central corridor

Even though the Central Corridor is not currently operational, interviews conducted within the RETRACK project have shown a rising interest towards this route from private operators. The reliability of the service and security of the cargo are at the top of the supply chain requirements for this corridor, followed by price and transit time of the service.

Shipment compatibility

The Central corridor is a one country corridor and railway infrastructure within Kazakhstan shares common technical and operational standards. Moreover, it has the same operating standards for infrastructure and rolling stock with Russia, its RETRACK interconnection country.

Lead time and lead time variability

There are several factors which affect the lead time on the Central corridor route:

- condition of the infrastructure and rolling stock;
- transit time at the stations;
- border crossing procedures.

An obsolete railway infrastructure and rolling stock considerably slow down the train speed on Kazakh network. In 2009 the average freight train speed was only 41,8 km/h[112]. The Kazakh Transport Strategy plans to increase the average freight train speed by 15-20% in general and by 20-30% on the international transport corridors by 2015. Moreover, due to the condition of the infrastructure and rolling stock, the rail freight in Kazakhstan involves time-costing wagon transmission/shunting works and locomotive changes at several intermediate points.

Container trains in Kazakhstan (as generally in Central Asia) are frequently intermingled with general mixed freight train traffic. Therefore, the lead time of container trains also depends on the frequency of service, volume and speed of the general railway traffic. Table 53 summarises the idle time of wagons at various railway stations along the corridor which also have an impact on the container train runs.

[112] ATF Bank Research, Analytical paper, 12, 2010, p. 19

Table 53: Idle time of wagons on the main stations of the corridor

Station	Idle time of wagons, hours			
	Transit, without processing		Transit, with processing	
	2006	2007	2006	2007
Ganushkino	4,48	4,09	7,7	8,35
Atyrau	2,21	2,1	15	14,38
Makat	2,46	2,28	10,2	11,18
Sagiz	5,3	2,95	16,9	11,95
Shubar Kudyk	2,23	1,92	18,99	14,88
Kandyagash	4,21	3,41	12,04	15,54

Source: OSJD Rail transport corridor n 8, 2009

The estimated transit time for the RETRACK – Lanzhou, via the Central corridor and Bratislava interconnection point by the mixed train, is in total +/- 36 days. Table 54 provides the division by the route section. As a comparison, the transit time for the container transport by the single wagon load train from Bratislava to Lanzhou via the currently operational routes Iletsk and Ozinki, is also 36 and 35 days respectively[113].

Table 54: Bratislava – Lanzhou transit time for the container transport by single wagon load traffic via Central corridor

RETRACK corridor section	Days, +/-
Bratislava - Zahon	5
Reforwarding Zahon – Chop	2
Chop – Donestk – Volgograd – Aksaralskaya – Almaty – Dostyk	18
Reforwarding Dostyk – Alashankou	3
Alashankou – Urumqi – Lanzhou	8
Total RETRACK – Lanzhou via Central corridor	**36**

Source: RETRACK interviews, Yusen Logistics, January 2012

Previous container train and block train runs through the territory of Kazakhstan show that the average container train speed within the territory of 300-350 km/day. The total distance of the Central corridor is 3,804,5 km. Therefore, it can be estimated that 11-12 days are needed to deliver cargo from Dostyk to Aksaralskaya by the block train. If regular locotomive changes, crew changes, technical inspections, waiting times at the key-stations are taken into consideration in the case of the single wagon load train, than the lead time along the Central corridor can be estimated of being an average of +/- 15 days.

Price

Table 55 presents the prices for the 20' containers transported through the territory of Kazakhstan for different rail routes for the single wagon load train.

113 RETRACK interviews, Yusen Logistics, January 2012

Table 55: Market price for 20' container transport (single wagon load) on the Kazakh part of different rail corridors

Section	20 TEU, USD
Central corridor: Aksaralskaya – Kandagash – Almaty - Dostyk	1,085
Trans-Asian route: Petropavlovsk – Astana - Dostyk	870
Ozinki – Kandagash - Dostyk	880
Iletsk – Kandagash – Dostyk	1,060

Source: RETRACK interviews, Yusen Logistics, January 2012

Table 56 gives further indications of the container transport costs for the transport from Central Europe (Rotterdam) to Kazakhstan, via the port of Riga.

Table 56: Overview of the container transport cost in Kazakhstan in 2011[114]

Route	20 TEU (up to 24 tons gross), euro	20 TEU (up to 30 tons gross), euro	Convoy 20 TEU, euro
Rotterdam – Alma-Ata I	2,363	2,925	73
Rotterdam - Aktobe	1,933	2,209	73
Rotterdam - Astana	2,002	2,307	118
Rotterdam - Atyrau	2,055	2,410	73
Rotterdam - Chimkent	2,211	2,671	73

Source: RETRACK interviews, SSR Eurasia 2, December 2011

The market price for the delivery of the 20' container from Bratislava to Lanzhou via Central corridor by a single wagon load train was in January 2012 6,773 - 6,892 USD depending on the container weight. Table 57 provides a detailed description of the applied tariffs.

Table 57: Market price for 20' container transport (single wagon load) from Bratislava – Lanzhou via Central corridor

Weight	Europe (EUR)	Ukraine (USD)	Russia (USD)	Convoy (USD)	Kazakhstan (USD)	China (USD)	Total (USD)
20'<8 tonne	480	729	1,045	1,085	80	3,200	**6,773**
20'<16,5 tonne	520	729	1,045	1,085	80	3,200	**6,825**
20'<22 tonne	570	729	1,045	1,085	80	3,200	**6,892**

Source: RETRACK interviews, Yusen Logistics, January 2012

As a comparison, Table 58 indicates the market prices for the 20'container transport from Bratislava to Lanzhou, using the rail routes via Ozinki and Iletsk.

114 Rates for Eurasia route apply to the container transport from Rotterdam to Riga by sea transport and further by rail transport through Moscow, Iletsk and to the destination point in Kazakhstan. They are valid for general cargo, for dry containers only. Rates include: 20' DV supply in Rotterdam; THC in Riga; Railway formalities; T-1; Preliminary declaration for Russian territory; Railway tariff FOR Riga – FOR Kazakhstan.

Table 58: Market price for 20' container transport (single wagon load) from Bratislava – Lanzhou via Ozinki and Iletsk

Route	Bratislava – Lanzhou via Ozinki (USD)	Bratislava – Lanzhou via Iletsk (USD)
20'<8 tn	6553	6623
20'<16,5 tn	6605	6675
20'<22 tn	6671	6741

Source: RETRACK interviews, Yusen Logistics, January 2012

The current rates for transportation of cargo to Kazakhstan and Belarus are quoted with 0% VAT for the Russian railway transit tariff, due to the Customs Alliance.

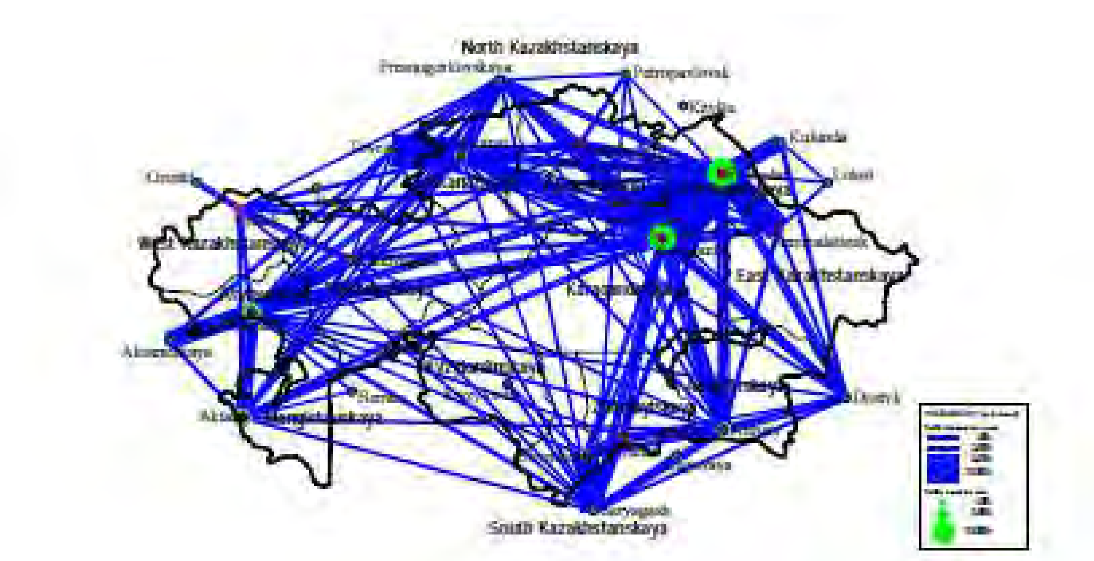
Interviewed companies have reported that there are no "special tariffs" on Kazakh routes and all rail costs are official. However, in order to speed up shipment at the Kazakh-Chinese borders, the "acceleration fee" varies from 30 to 100 USD per container.

Frequency of service

The frequency of block train services to be implemented on the Central corridor depends on the demand for the services and available capacity of the railways.

The available railway capacity of the Central corridor is determined by national and international transport flows. The JICA study made an estimate of the freight demand on the existing railway network for the year 2017 (Figure 15)

Figure 15: An estimate of the freight demand in 2017 in Kazakhstan



Source: The Study for the project of the integrated logistics systems and marketing action plan for container transportation, JICA, December 2007, p. 5-12

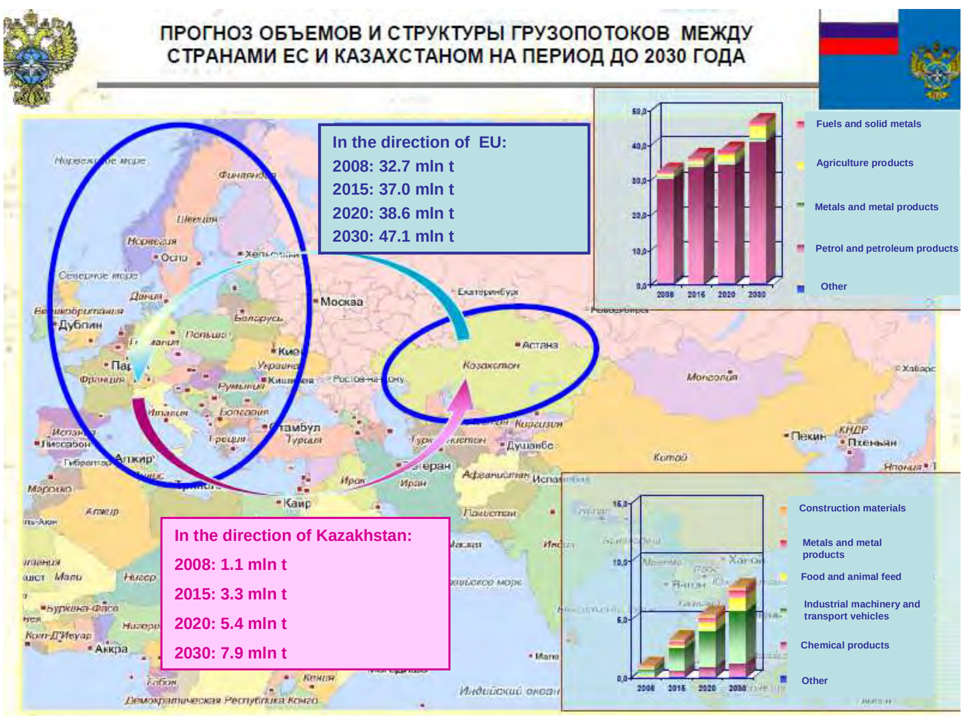
This figure illustrates that even though some sections of the Central corridor will be intensively used for the provision of regional and international trade flows, in general the main weight is forecasted to be on other Kazakh railway lines.

In international dimension, volume wise the following flows were identified in 2011 that could potentially make use of this corridor, but are at present using other routes[115]:

- China to Ukraine: 110,000 tonnes (labelled as “other goods”, e.g. consumer goods, electrical goods, chemicals)
- Russia to China: 200,000 tonnes fertilisers (are currently transported through Tobol)
- China to Russia: 200,000 tonnes “other goods” (are currently transported through Tobol).

The Central corridor is not only interesting as a transit possibility from Europe to China, but also provides growing volumes for the Kazakhstan – EU trade. As can be seen in Figure 16 and according to the Russian forecasts, by 2030 the volume of cargo flows between Kazakhstan and the EU will have increased considerably.

Figure 16: Forecast of the volumes and structure of the freight flows between EU and Kazakhstan for the period before 2030



Source: Alexeev A. Transport infrastructure, priority projects. Presentation on 6th session of UNECE Group of experts on EATL II, Almaty, Kazakhstan.

115 RETRACK interviews with Spedition ltd, November 2011

The economic specialisation of the main centres situated along the Central corridor is oriented on the heavy industrial activities, such as energy products, steel, (petro)chemical and voluminous agricultural products. These products are well suited to rail transport and as such, it is expected that bulk trains will have the lead in the development of this route. Other products that have been identified as a potential market for the Central corridor are: FMCG (clothes, shoes, household goods, home appliances), cars, spare parts, building materials, food.

However, for unitised and/or containerised transport it would be the connection between China and Europe that could generate sufficient volume to see regular block trains transiting this route. It can therefore be concluded that this route will only see significant and relevant development on the medium to long term. On the other hand, in the situation where supply chains are increasingly pressured, e.g. through internalisation of environmental (or external) costs, then this route can be expected to be developed quicker, given its favourable competitive position in terms of distance.

If the current and regular demand for the block train is not supported with adequate trade volumes, then this situation could be scientifically changed. We will further discuss the economic potential of the Central corridor in Chapter 6.

There is enough spare capacity on the railways to introduce new train services, as the majority of the oil, which was formerly transported by railway in Kazakhstan, has been redistributed to the pipelines. Container transport in Kazakhstan is currently operated in the ordinary freight trains. That is relatively difficult to gather enough container cargoes to make an exclusive container train.

Since 2001 several container and block train runs have been organised through the territory of Kazakhstan. As can be seen in Table 59, the majority are not/were not scheduled regularly and are/were running upon formation.

Table 59 also illustrates that the operation of the container trains in Kazakhstan has registered a steady growth between 2001 and 2006. Between 2004 and 2005 the operation of international container trains more than doubled and in particular increased between Lianyungang and Almaty. Most of these trains crossed through Dostyk/Alashankou. In 2001 there was only 1 block train running in the territory of Kazakstan and in 2008 this was already 10 trains.

Table 59: Container trains in Kazakhstan since 2001

The route	Distance, km	Average train run-time	Average train speed, km/d	Route opening year	Traffic working regularity
Ürümqi-Dostyk-Petropavlovsk-Krasnoye-Brest-Kunovitse-Berlin	6,658	8d. 03 h. 45 m.	817	2001	upon formation
Nakhodka-Locot-Almaty-Tashkent	8,689	9d. 20 h.	880	2003	upon formation
Nakhodka-Locot-Almaty	7,712	8 d. 12 h.	907	2003	1 trains p. week
Almaty-Alashankou	873	1 d. 8 h. 30 m.	645	2003	5 trains p. week
Almaty-Tashkent	1,006	1 d. 7 h. 35 m.	727	2003	upon formation
Lianyungang-Almaty	5,043	8 d. 4 h. 25 m.	605	2004	7 trains p. week
Tiantsing-Almaty	4,852	7 d. 19 h. 12 m.	622	2004	4 trains p. week
Almaty-Ozinki-Novorossiysk (Turkey)	4,406	6 d. 5 h.	709	2004	upon formation
Almaty-Locot-Eastern Nakhodka	7,712	8 d. 20 h. 44 m.	870	2004	upon formation
Lianyungang-Assake	6,491	8 d. 7 h.	282	2005	2 trains p. week
Akaltyn-Tsindao	6,622	8 d. 16 h.	764	2005	upon formation
Aksu 1-Tobol-Kherson	4,159	6 d. 11 h. 22 m.	642	2006	upon formation
Nakhodka-Locot-Saryagash-Assake	9,170	12 d. 23 h.	708	2006	2 trains p. week
Ürümqi-Novorossiysk	5,792	7 d. 10 h.	780	2006	upon formation
Ürümqi-Kulindorovo	6,865	8 d. 7 h. 20 m.	770	2006	upon formation
Aksu-Klaipeda	3,677	4 d. 23 h.	741	2007	upon formation
Ürümqi-Almaty	1,333	1 d. 23 h.	680	2007	upon formation
“Baltic Transit”	4,349	6 d. 14 h.	660	2001	1 train p. week
Novorossiysk-Almaty	4,406	6 d. 5 h.	709	2007	upon formation
Lianyungang-Moscow	9,061	12 h. 9 h.	732	2007	upon formation
Lianyungang-Chukursai	6,026	7 d. 14 h.	794	2007	upon formation
Tsindao-Chelyabinsk	6,521	8 d. 04 h.	798	2007	upon formation
Ürümqi-Chukursai	2,328	3 d. 04 h.	735	2007	upon formation
Tiantsing-Ulugbek	6,161	8 d. 06 h.	746	2007	upon formation
Aksu-Chindao	5,762	8 d. 23 h.	643	2008	upon formation
Zhinishke-Klaipeda	2,940	4 d. 21 h.	602	2008	upon formation
Muuga-Almaty	5,803	10 d. 08 h.	561	2008	upon formation
"Kazakhstan vector"	4,502	6 d. 15 h.	679	2008	upon formation
Lianyungang-Osh	6,577	8 d. 14 h.	766	2008	upon formation
Lianyungang-Alamedin	5,616	8 d. 6 h.	680	2008	upon formation
Shēnzhèn-Pardubice	12,360	18 d.	687	2008	upon formation
Chongtsindong-Cherkessk	8,969	16 d. 03 h.	569	2008	upon formation
Ürümqi-Hamburg (via Riga port)	5,806	10 d. 20 h. 46 m.	533	2008	upon formation
Tiantsing-Kuncevo	8,488	15 d. 02 h.	562	2008	upon formation

Source: http://www.kts.kz/ru/clients/train/

Table 60 presents the routes on which container trains were operating in the Kazakhstan territory in 2011.

Table 60: Container trains in Kazakhstan in 2011

Itinerary	Frequency per month
Almaty – Alashankou	31
Almaty - Khairaton	1
Aksu – Qingdao	8
Zhetusy - Alashankou	1
Liányúngǎng - Almaty	49
Tianjin - Almaty	2
Nahodka – Lokot - Sariagash	7
Nahodka – Lokot - Galaba	1
Nahodka – Lokot - Almaty	11
Liányúngǎng - Sariagash	5
Liányúngǎng - Sergeli	1
Liányúngǎng - Alamedin	1
Cherkessk - Chongqing	1
Hamburg – Aktau - Galaba	4
Hamburg – Riga - Ozinki - Galaba	4

Source: RETRACK interviews, Yusen logistics, January 2012.

At present, no regular block or container train services have been identified on the Central corridor. This is mainly due to the lack of cargo and the operational issues with transit between Ukraine and Russia. However, at the same time there is enough capacity to introduce new services.

Damages and theft

Damages and theft are one of the top reasons why shippers avoid the transport of their cargoes in the territory of Kazakhstan. This is due to the general problem of the unavailability of a unified track and trace system in the region and also because of organisational heritage.

For example, when following the present rules which regulate container transport (inherited from the Soviet Union) in Kazakhstan – it is only the consignee who can return the container to the nearest rail station (railway bills are filled in accordingly). There is no penalty foreseen in the case he/she does not. This represents a considerable obstacle for the foreign shipping lines to operate in Kazakhstan: where KTZ can easily control whether their equipment is at stake, foreign shipping lines can not. The Motorways of the Sea Thematic Railways report (2010, p 38) indicates that after a considerable amount of losses for major container carriers, they decided to no longer send their equipment through Central Asia.

In Kazakhstan, as in other Central Asian countries, freight transport information and the majority of the real-time communication on the railway system is done by telephone. Such procedures include manual handling and lack accuracy in communication quality and transmission speed. Information about container transport is exchanged by telephone, fax and internet. At the same time, the TERA international group, REG: Central Asia Regional Economic Cooperation Transport Sector Strategy Study (p 129) reports that the electronic tracking and data management is now slowly taking over from paper systems. In Kazakhstan the ACTOM (Automated System for Transportation Operation Management) system is available. This is the existing main information system running at the KTZ data center in ASTANA on host computers. The system managers information on train departures and arrivals along with information on how the trains are made up. It also makes it possible to carry out location controls and inventory controls of wagons. However, even though the system is available, it still presents a problem as it is not always well utilised because the network has not been fully implemented at all of the necessary sites. In addition, some system users do not know how to use ACTOM correctly or the data entry is not easy to implement[116] (JICA, 3-70).

6.3.2 Major risks along the corridor

There are several potential risks for the development of the container trains on the Central corridor:

- Infrastructure capacity bottleneck at the border crossing with China;
- Insufficient progress in infrastructure development and rehabilitation on the Central corridor which results in the speed decrease;
- Insufficient cargo volumes in order to organise regular train runs;
- Lengthy processing time required for customs clearance and border controls;
- Lack of common interpretation of related laws and regulations coupled with complicated procedures, resulting in a risk of administrative mistakes and an increase of the lead time;
- Difficulty in guaranteeing the reliability of a transport service (punctuality, safety and cargo information) by one transporter to cargo owners;
- Although freight information is partially processed by computer, on-rail information transmission is generally done by telephone and other methods, including manual work, which decrease the speed and reliability of the information delivered.

The major challenge for the future development of the Central corridor is its competitive position with the TransSib and in particular the TransSib – Kazakh route (if the destination point is Western China). The development of the international railway corridors through the Northern and Eastern part of Kazakhstan depends significantly on the infrastructure condition of the relevant sections of the Russian railways. In this regard, the Russian section of the RETRACK – Central corridor interconnection creates the greatest weakness for the corridor. First of all, as described in Chapter 3, the condition of the infrastructure on the Russian railway section is poor, single track and not electrified. Secondly, the operational and political issues which characterise the Russia – Ukraine relationships also have an impact on the Central corridor development. If there

[116] The Study for the project of the integrated logistics systems and marketing action plan for container transportation, JICA, December 2007, p. 3-70

is no decision from Russia to support the development of the Central corridor or if there is not enough cargo to initiate this development, then the option of the regular container train service on the Central corridor does not seem feasible.

6.4 Operational and technical barriers along the Central corridor

6.4.1 Technical barriers

The major identified technical barriers for the RETRACK – China connection via the Central corridor are summarised below:

- Different gauges within the RETRACK countries and China (Europe, China – 1,435 mm, Kazakhstan – 1,520 mm);
- Different electrical systems on the separate segments: 3kv, 25kV 50Hz and a considerable amount sections that are not electrified;
- Different signalling and control systems: not all of the railway sections along the Central corridor are equipped with signalling systems.

6.4.2 Operational barriers

As the Central corridor is not currently being used actively for international transport, the potential operational barriers can only be identified from the experiences of other block train runs through the territory of Kazakhstan. According to these experiences, border-crossings and the lack of administrative transparency are the main operational bottlenecks.

Border crossing

Focusing on the Kazakhstan part of the corridor, the two main border crossings are:

– border crossing with China (Dostyk – Alashankou)

– border crossing with Russia (Ganushkino – Aksaralskaya II).

The Dostyk – Alashankou border crossing and capacity/bureaucracy problems related to it are discussed in more detail in the deliverable 13.1. Table 61 summarises the main characteristics of the Ganushkino – Aksaralskaya II border crossing.

Table 61: Characteristics of the Russia – Kazakhstan border crossing station

Railway corridor section	Title of the border crossing	Title of the station	Established time norm for operations, minutes	
			Export	Import
Russsia[117]*				
Aksaralskaya – Aksaralskaya II – border crossing with Kazakhstan	Aksaralskaya (RF) – Ganushkino (KAZ)	Aksaralskaya II	n/a	n/a
Kazakhstan*				
Border crossing with Russia - Makat	Aksaralskaya (RF) – Ganushkino (KAZ)	Ganushkino	250	250

Source: OSJD Rail transport corridors n 8, 2009

In 2010 the Aksaralskaya – Ganushkino border crossing was one of the top 6 railway border crossings in Kazakhstan in terms of volume of cargo transported. Table 62 shows that Aksaralskaya was the 4th most important border crossing for the Kazakh rail traffic in 2008.

Table 62: Distribution of Kazakhstan border crossing traffic by country, share of total volume (%), in 2008

Border crossing station	Export	Import	Transit	Total
Iletsk	0,9	16,8	4,8	**4,0**
Ozinki	3,3	6,6	6,2	**4,4**
Petropavlovsk	5,2	9,1	4,9	**5,7**
Kulunda	8,7	6,9	1,0	**6,7**
Tobol	31,7	21,5	2,5	**23,9**
Aksaralskaya	13,2	11,6	11,7	**12,6**
Nikeltau	1,0	6,5	5,6	**2,8**
Presnogorskaya	22,7	22,7	-	**14,5**
Lokot	1,2	9,3	9,6	**4,24**
Sary - Agach	7,6	6,7	33,8	**13,3**
Oazis	0,5	0,7	10,6	**2,78**
Pahtaarl	0,07	-	-	**0,04**
Lugovaya	3,3	3,7	8,8	**4,6**
Total	**63,8**	**14,2**	**21,8**	**100**

In general, Tobol, Iletsk, Aksarajskaya, Lokot, Petropavlovsk, Kulunda and Ozinki account for 80% of the import and Sarah-Agach, Aksarajskaya, Oasis, Lokot, Lugovaya and Ozinki account for more than 80% of the Kazakhstan transit cargoes.

[117] Time norms for the border crossing Russia – Kazakhstan are indications before implementation of the customs union.

Since the implementation of the Customs Union between Russia, Belarus and Kazakhstan the border crossing formalities between these two countries have considerably decreased. The customs control, transport inspection and sanitary control were transferred from the Russian – Kazakh borders to the external border of the Customs Union. Locomotive change is still preserved at the Aksaralskaya – Ganushkino border crossing. Therefore, estimated time for the border control operations and locomotive change at Aksaralskaya/Ganushkino border is maximum 1 day.

Lack of the administrative transparency

Lack of the administrative transparency is observed in all Central Asian countries and in Kazakhstan in particular. Administrative rules and documentation are often unclear and concrete information is not always easily accessible. Moreover, procedures and formalities to be followed are regularly changed. As a result of the Customs Alliance shippers also need to be sure that all necessary stamps are placed on the railway bills, as they are required for conforming 0% VAT.

6.5 Summary of the Central corridor potential for RETRACK

The Central corridor is a railway route which crosses the Kazakhstan territory from its Western border with Russia to the Eastern border with China, following the main stations: Aksaralskaya/Ganushkino – Kandagash – Shimkent - Almaty – Dostyk/Alashankou. The main technical and operational characteristics of the Central corridor are summarised in the Table 63.

Table 63: Summary of technical and operational characteristics of the Central corridor

Route	Central corridor
Distance, km	3,804,5
Double track, km	798
Electrified, km	494.1
Electrification system	25kV 50Hz, not electrified sections
Gauge	1,520
Maximal axel load on the railway section (T)	23 - 25
Max train length (m)	1,000
Max train mass (T)	2,800 – 3,200
Loading gauge	T, 1-T

The maximum freight train speed on the corridors varies from 60 – 80 km/h. The average freight train speed is 40 km/h. The average container train run speed within the territory of Kazakhstan is 300 – 350 km/day.

In terms of distance, the Central corridor offers one of the shortest options to connect Western China and Central Europe. It also provides a seamless railway route from the Eastern Asia coastline to major European industrial areas with a minimum number of transshipment points. Despite this however, the development of the corridor currently does not receive any national or international support. The railway infrastructure on the corridor is in poor technical condition, is not electrified over its longest section and is mainly single track. Considerable improvement by 2020 is foreseen within the National Transport Strategy and by means of targeted projects of international organisations. Moreover, neighbouring countries (e.g. Russia) have additional projects which will impact the overall performance of the Central corridor. The construction of the additional railway lines will create alternative solutions to connect Eastern and Western Kazakhstan.

There is a high potential for the container train development which is supported by the national government. The number of the container block train runs through the Kazakhstan territory is increasing constantly, however, they remain targeted company initiatives. There is enough railway capacity in order to introduce a new regular train service. Several studies conducted forecast the increasing potential of this route in terms of volume for the provision of the internal Kazakh train, EU – Kazakhstan trade, as well as the EU – China transit.

According to the experiences and estimations, it takes a maximum of 13 days to run a block train from the Aksaralskaya/Ganushkino border through the Central corridor to the Dostyk railway station in Kazakhstan. When the on-going infrastructure modernisation plans, as well as the Khorgos terminal are fully functional, this lead time will be considerably decreased.

Currently, there are several technical and operational bottlenecks on the RETRACK – Central corridor service to China. First of all, different gauges, different electrification and signalling systems impact the railway transport interoperability on the corridor. Secondly, the infrastructure and rolling stock condition require a frequent change of locomotives and increase the lead time. Thirdly, the Dostyk/Alashankou border crossing sometimes includes very time consuming procedures because of the insufficient terminal capacity and lack of administrative clarity. The potential clients of the Central corridor also refer to the following risks associated with this route:

- lack of administration clarity
- lack of common interpretation of related laws and regulations
- difficulty in guaranteeing the reliability of a transport service and high risk of damage and theft
- absence of modern track and trace equipment.

7 TRACECA corridor

In this chapter the features particular to the TRACECA corridor and the TRACECA – Turkmenbashi and TRACECA – Aktau routes are described.

7.1 Organisational model of the corridor

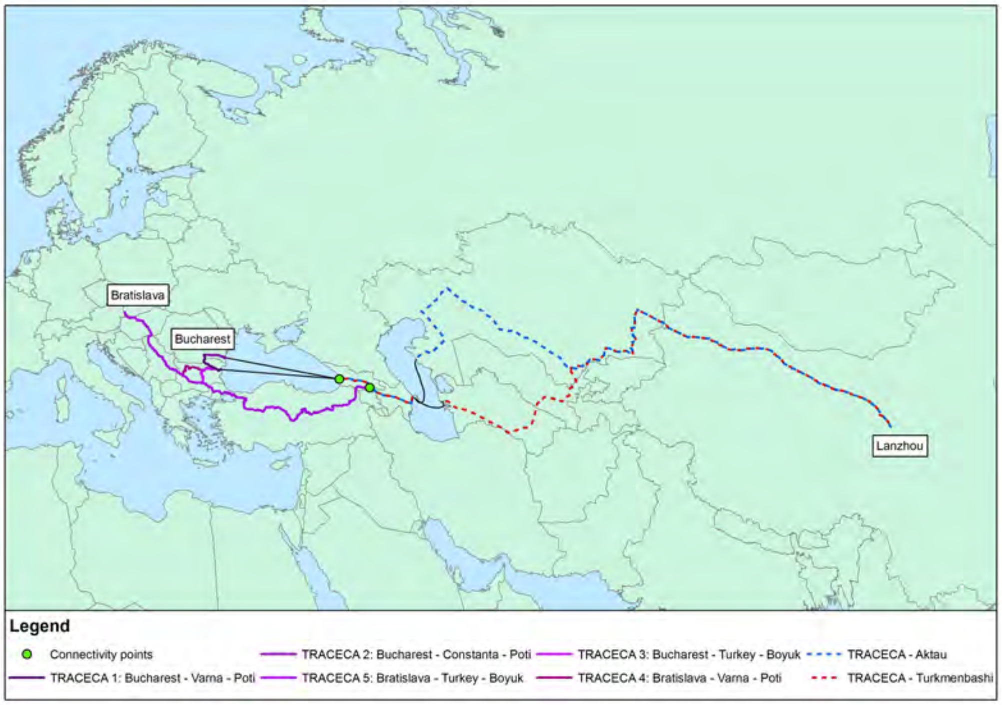
Although the TRACECA initiative brings the countries together in order to develop and promote the common transport corridors, in practice the integrated TRACECA railway corridor does not exist. The TRACECA secretariat is coordinating a number of joint projects of which there are none on the railway corridor development (not to be confused with different projects on the national or border crossing infrastructure modernisation).

Additional projects on the institutional and organisational building of railway corridors in the Central Asian region are carried out within the CAREC initiatives. At the same time, the proposed CAREC corridors are not entirely the same as the TRACECA railway corridors. Therefore, at present infrastructure improvement initiatives are more often carried out on a national level (sometimes even decreasing the interoperability of the entire corridor). Different multilateral agreements existing in the region are usually concluded between two to three countries in order to improve border crossing issues or to establish more transparent tariff formation mechanisms.

In the present deliverable two TRACECA railway routes are assessed: the TRACECA – Turkmenbashi and the TRACECA – Aktau rail routes. Map 8 illustrates them.

The TRACECA – Turkmenbashi and TRACECA – Aktau routes follow the same railway segments from Poti to Baku and from Arys to Dostyk and further to China. They vary in their central section, with the TRACECA – Aktau route following only through the territory of Kazakhstan.

Map 8: Railway corridor and associated routes



7.2 Infrastructure assessment of the TRACECA corridor

7.2.1 Technical and operational characteristics of the TRACECA – Turkmenbashi route

Routing: Poti (GEO) – Gardabani (GEO) – Boyuk Kasik (AZ) – Baku (AZ) – Caspian Sea – Turkmenbashi (TKM) – Turkmenabad (TKM) – Khodza Davlet (UZB) – Keles (UZB) – Sary Agash (KAZ) – Almaty (KAZ) – Dostyk (KAZ)

Technical characteristics of the route

In total, the TRACECA – Turkmenbashi route is almost 5,000 km long with only half of its length double track and electrified with both the 3kV and 5kV50Hz systems.

Table 64 summarises the condition of the infrastructure on the TRACECA route.

The TRACECA section of the Georgian railway line has partially double and single track lines[118]: from Poti to Senaki the line is single track; from Senaki to Samtredia double track; from Batumi to Samtredia the line is single track; from Samtredia to Zestaphoni the line is double track; from Zestaphoni to Khacuri 4 km are single track and the remaining stretch is double track; from Khachuri all the way to the Azerbaijan border there is a

118 The Motorways of the Sea for the Black Sea and the Caspian Sea, Thematic Railways report, July 2010

double track. Some sections of the railway line currently bear traffic near to their maximum capacity. Almost all the lines have a semi-automatic blocking system which does not allow more than one train to be sent between two stations.The loading gauge of the Georgian railways is T[119] and the maximum train mass differs between 2,500 to 3,000 t on the different sections.

Table 64: Characteristics of the TRACECA – Turkmenbashi route by segments

Section of the route	Country	Distance, km	Double track, km	Electrification, km
Poti - Gardabani	Georgia	355	294,8	355 km with 3kV DC
Gardabani – Boyuk Kasik border crossing	Georgian – Azerbaijani border	Change of locomotive, customs clearance, border crossing control, technical inspection		
Bouyk Kasik - Baku	Azerbaijan	503	503	3kV DC
Baku - Turkmenbashi	Caspian sea ferry	270 km, Change of locomotive, customs clearance, border crossing control, technical inspection		
Turkmenbashi - Turkmenabad	Turkmenistan	1,142	0	Not electrified
Turkmenabad – Khodza Davlet border crossing	Turkmenistan – Uzbekistan border	Change of locomotive, customs clearance, border crossing control, technical inspection		
Khodza Davlet – Keles	Uzbekistan	723,4	403,4	394,6 km with 25kV AC 50Hz
Keles – Sary Agash	Uzbekistan – Kazakhstan border crossing	Change of locomotive, customs clearance, border crossing control, technical inspection		
Sary Agash - Dostyk	Kazakhstan	1,766,3	835,6	835,6 km 25kV AC 50Hz
Total		**4,759,7**	**2,036,8**	**2,088,2 with 3kV DC, 25kV AC 50Hz**

Source: OSJD Rail transport corridor n 10, 2010

The Azerbaijani section of the railway up until Baku is a double track line with the exception of one bridge with a single track in Powlu. This one single track section reduces the capacity of the entire line. The railway line is electrified and equipped with an automatic block system and dispatching control system. At the stations there are electrical switches with the exception of 3 stations with manual switches. The loading gauge is 1 -T[120] and the maximum train mass is 2,800t. The maximum axel load is 23 tonnes.

[119] Loading gauge T is one of the government standards for the wagons in RF and former Soviet Union countries. It is mainly used on the main lines.

[120] Loading gauge 1 - T is one of the government standards for the wagons RF and former Soviet Union countries. The wagon has smaller dimension that for the T standard.

The railway section of Turkmenistan is one of the longest within the entire TRACECA corridor. It is fully single track and not electrified and represents the weakest section of the corridor. The loading gauge on the entire Turkmenistan section is 1T.

The Uzbekistan section of the TRACECA corridor is about 762 km long, of which almost 60% is double track and more than a half is electrified. The infrastructure is reported to be in good condition, even though the single and double track sections are alternating and reducing the average speed of the trains.

Moreover, the majority of the Kazakh section of the corridor is single track and not electrified. The Kazakhstan section of the TRACECA – Turkmenbashi route follows the same railway segments as the last section of the Central corridor. The loading gauge from Sary-Agash to Almaty is T and from Alamty to Dostyk is 1-T. The maximum train mass is 2,800 T and the maximum load on the TRACECA section is 23 tonnes.

In total, the TRACECA – Turkmenbashi route is almost 5,000 km long with only half of it double track and electrified with both the 3kV and 5kV50Hz systems.

There are a lot of ongoing initiatives and projects for the modernisation and rehabilitation of the railway infrastructure within the TRACECA region. The majority of these projects have a national character. Some are aimed at creating new railway lines and some are focused on the upgrade of the existing infrastructure.

In Georgia, there are several projects relevant for the TRACECA corridor. “Georgian Railway” LLC has launched the “Tbilisi Railway Bypass project” for developing a new railway route bypass around the city of Tbilisi and the redevelopment of an existing alignment in the centre of the city. Within the project a 38 km long, double track and electrified new railway line will be constructed and electrified with the direct current of 3.3 kV DC.

This project also includes the construction of a new freight station, an upgrade of a number of existing stations, rehabilitation of the existing single track lines and construction of an additional new single track line. The expected completion of the project is 2013.

The planned Tbilisi-Poti/Batumi modernisation project aims to increase traffic capacity and reduce travelling time between the Poti/Batumi ports and Tbilisi. The project implies the complete modernisation of the current railway infrastructure and an upgrade of the line to the speed of 120 km/h. At present, feasibility studies are being conducted and the project is scheduled to be completed by 2013.

The new Baku-Tbilisi-Kars railway corridor project aims to connect the Georgian, Azerbaijani and Turkish railways. The implementation of this corridor (which includes rehabilitation of existing lines and construction of the new sections) will provide TRACECA with another alternative railway corridor. The construction of the new sections is ongoing.

In Azerbaijan, the ongoing Railway Trade and Transport Facilitation project (financed by the World Bank and the Azerbaijani Government) includes the rehabilitation of the Baku -

Georgian border railway section and the procurement of the new electric tools. At present and according to the project results, 67% of track are in critical condition over the whole East - West corridor and only 5 locomotives are able to cross the territory of Azerbaijan reliably (non-stop). As the result of the improvements foreseen by the project the speed of the train will be increased up to 160 km/h and the travel time from Baku to the border will be reduced to 7-8 hours (from present 14-16 hours). The electrification system will be converted from the 3,3kV to the 25kV AC 50 HZ Current and the signalling equipment will be upgraded. The capacity of 60 pairs of trains is expected[121] after the rehabilitation.

The facilities of the existing Baku port are obsolete and need renewal. The existing Baku port is no longer capable of expansion, therefore, the Government of Azerbaijan plans to construct a new port with a logistics terminal 70 km South of Baku at Alyat. The new trade port will lie on the intersection of two main Azerbaijani railways (where the TRACECA and North-South Corridor also intersect). Facilities will include a rail ferry terminal, a Ro-Ro terminal and a container terminal. The construction finalisation is palnned for 2016.

The Turkmenbashi port also plans to make improvements. The new port master plan was carried out by a Korean engineering company and the construction of a new logistics centre and container terminal are planned. In addition, there is also a plan to expand the nearby Ekarem port and to create a free trade zone.

The foreseen and ongoing infrastructure improvement projects in Uzbekistan, which will improve the Uzbek TRACECA section are:

- Planned in 2010 – 2015 electrification of the high traffic density sections, including: Samarkand-Navoi – Uchkuduk – Urgench - Nukus section and Navoi - Bukhara railway line;
- Feasibility studies were carried out for the Uchkuduk - Kyzyl Orda connection which can offer some alternatives for the railway corridors within the TRACECA region[122];
- Discussions of a project to construct a China – Kyrgyzstan – Uzbekistan railway, which will compete with the China – Kazakhstan – Uzbekistan railway.

There are several projects of high importance which are currently being executed in Kazakhstan. The ongoing project towards the construction of the double track railway line from Almati - Korgas in Kazakhstan to the Chinese border – Urumqi will provide an alternative to the Dostyk inland connection with China. This will also shorten the TRACECA route by around 500 km. The construction of the railway sections in both countries is ongoing and is planned to be finalised in 2012. To promote trade between China and Central Asia, the PRC and Kazakhstan have created a 178 km2 “China Kazakhstan border free trade zone” in the same area.

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[121] The Motorways of the Sea for the Black Sea and the Caspian Sea, Thematic Railways report, July 2010

[122] TERA international group, REG: Central Asia Regional Economic Cooperation Transport Sector Strategy Study, December 2008, Appendix 3, p. 99.

Main terminals on TRACECA – Turkmenbashi route

There are several intermodal and logistics terminals along the TRACECA - Turkmenbashi corridor which are of a high importance as they represent the intermodal transshipment points and determine the overall capacity and performance of the entire corridor.

The Poti Sea Port is the largest commercial port of the Republic of Georgia and handles liquid and dry bulk, ferries and containers. The port has dedicated ferry and container terminals. The railway operation inside the port area is managed by the Georgian railways. The distance between the port and the railway station is about 1 km. The station has 12 tracks in the arrival area (plus 2 under construction) and 8 tracks in the departure area. The capacity of the station is limited by the track sections that connect the different areas of the station (arrivals, departures, waiting tracks)[123]. The station has automatic switches controlled by remote. The access from the port to the railway station is of low speed and the maximum capacity is 20,000 t cargo/day (equivalent to about 300 pairs of wagons). In terms of trains, the empty wagons/containers must also be considered. The maximum capacity is 15 pairs of trains per day and the maximum number of wagons per train is 40. Recently, Berth 14 of the Poti port has been rehabilitated to provide a longer and deeper berth to accommodate 1,000 TEU feeder vessels with a somewhat larger container terminal yard and good intermodal rail connections. The EBRD is currently considering funding for this rehabilitation work (MoS Country report).

The Azerbaijani railway has 176 freight stations, of which Bilajari is a large automated sorting station. Keshla and Khirdalan are 40' container depots which are situated in the Baku area and are therefore along the TRACECA corridor. The Gandja depot situated on the Azerbaijani TRACECA route also has the necessary equipment to handle 40' containers and 12 other stations over the entire rail network are each able to handle 20' containers (tables 65 and 66 present the more detailed overview).

The Baku International Sea Trade Port is one of the most important transport nodes on the TRACECA railway route. It is the State owned port, comprised of a Main Cargo Terminal, the Dubendy Oil Terminal and the Ferry and Passenger Terminal. The Ferry terminal is used for transshipment of wagons, trucks and cars and the embarkation/disembarkation of passengers. The distance between the Port and the Baku Railway Freight Station is about 2 km. The line is electrified and single track, however it is planned to upgrade this line to double track and equip it with automatic switches. The maximum capacity of the station is 17/18 pairs/day, but in reality up to 9 pairs of trains/day (with the majority being oil trains) is managed there. The maximum length of trains is 47 – 48 wagons and the maximum weight of train is 2,800 T. Bilajar marshalling station is located 20 km from the station and is where the trains are sorted. There is also another part of the station where the import/export customs operations are performed. The transit operations are performed in the port[124].

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123 The Motorways of the Sea for the Black Sea and the Caspian Sea, Thematic Railways report, July 2010 p 24

124 Idem

The Turkmenbashi port if one of the most important transport nodes in Turkmenistan and of great importance for the TRACECA route in particular. The Port is situated 22 km from the coast and has 140 – 200m wide one-way vessel channel access with a draught of 5.1m. The port has 6 oil berths, 4 dry cargo berths and a rail ferry berth which handles a service to Baku. Some of these berths were recently rehabilitated with loans from the EBRD. There are several railway lines serving the port, one of which is a dedicated ferry terminal line. The Turkmenbashi port has 11 berth cranes with a load capacity of 6 – 100 tonnes[125]. There is a special area (4,000 m2) reserved for the processing and storage of containers.

Other important terminals on the TRACECA -Turmenbashi route in the territory of Turkmenistan are the Gypchak and Farab railway stations. The Gypchak railway station (located 7 km from Ashgabat) is an important Turkmen point for the dispatch of containers. It can operate 40' containers and therefore, has become one of the most important sorting stations in Central Asia within the Turkmenistan limits. The Farab railway station is situated not far from the Uzbek border and the passing capacity of the station is approximately 40 containers/day. The railway station cannot accept 40' containers due to the absence of the required handling equipment and the warehousing capacity of the station is limited and requires substantial renovation.

The largest Uzbek intermodal terminals situated along the TRACECA – Turkmenbashi route are Chukursay (maximum container storage capacity 600 TEU), Tashkent-Tovarynyi (250 TEU), Bukhara (260 TEU) and Sergeli (592 TEU). The intermodal terminals in Uzbekistan are generally small, inefficient and handle a very light amount of traffic and the lack of multimodal terminals and equipment can be clearly observed in the country. The largest intermodal terminals positioned along the TRACECA route are: There are 364 freight stations over the entire length of the Kazakh railway network. On the TRACECA – Turkmenbashi railway corridor two of the six main national freight yards (Arys and Chu) as well as two of the most important container terminals (Taraz and Dostyk) are situated.

Table 65 gives an overview of the main railway stations along the TRACECA – Turkmenbashi route[126] and table 66 gives an overview of the main container terminals which are situated along the route.

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[125] International Logistics Centers/Nodes network in Central Asia, Task report A – Uzbekistan, September 2009, p 16

[126] The list is not exhaustive and presents only the main railways stations

Table 65: Main railway stations on the TRACECA – Turkmenbashi route

Country	Name of the station	Type of the station
Georgia	Rustavi	Freight[127]
	Tbilissi S.	Marshalling yard[128]
	Tbilissi U.	Freight
	Tbilissi G.	Freight
	Hashuri	Siding[129]
	Zestafoni	Siding
	Samtredia II	Marshalling yard
	Poti	Freight
Azerbaijan	Baku	Marshalling yard
	Boyuk Kasik	Freight
Turkmenistan	Gypchak	Marshalling yard
	Anev	Marshalling yard
	Farab	Marshalling yard
Uzbekistan	Buhara	Marshalling yard
	Marakand	Siding
	Havast	Marshalling yard
	Chukursay	Marshalling yard
	Tashkent	Freight
Kazakhstan	Sary Agash	Siding
	Arys	Marshalling yard
	Shimkent	Siding
	Tjulkubass	Siding
	Zjambil	Siding
	Lugovaya	Siding
	Almaty I	Freight
	Avtogay	Siding
	Dostyk	Freight

Source: OSJD Rail transport corridor n 10, 2010

[127] Freight station is a station where loading/unloading or other commercial operations with freight wagons take place

[128] Marshalling yard is a station where massive operations with freight wagons take places as well as re-composition of trains

[129] Siding station is a station for the transit cargo operation and formation of the local trains. Often locomotive and crew change takes place their.

Table 66: Main container terminals on TRACECA – Turkmenbashi route

Country	Terminal	Containers handled	Handling capacity (TEU/day)	Storage capacity, TEU
Georgia	Poti	3t, 5t, 20', 40'	n/a	9,200
	Tbilissi	3t, 5t, 20', 40'		4,000
Azerbaijan	Kishli	3t, 5t, 20', 30', 40'	100	1,200
	Gjandja	3t, 5t, 20', 30', 40'	20	120
Turkmenistan	Gapdjak	3t, 5t, 20'	80	3,000
	Altyn	3t, 5t, 20'	55	1,488
	Zerger	20'	80	1,752
Uzbekistan	Buhara	3t, 5t, 20', 40'	20', 40' – 60 3t, 5t, 20', 40' - 354	20', 40' – 260 3t, 5t, 20', 40' - 364
	Ulugbek	3t, 5t, 20', 40'	20', 40' – 120 3t, 5t, 20', 40' - 354	20', 40' – 500 3t, 5t, 20', 40' - 1280
	Djizzak	3t, 5t, 20', 40'	20', 40' – 60 3t, 5t, 20', 40' - 177	20', 40' – 240 3t, 5t, 20', 40' - 780
	Havast	3t, 5t, 20', 40'	354	288
	Tashkent	3t, 5t, 20', 40'	531	1,716
	Chukursay	3t, 5t, 20', 40'	20', 40' – 420	1,200
Kazakhstan	Shimkent	3t, 5t, 20'	40	375
	Almaty I*	20', 40'	70	1,000
	Almaty II*	3t, 5t, 20', 40'	60	-
	Dostyk	20', 40'	150	500

Source: OSJD Rail transport corridor n 10, 2010

7.2.2 Technical and operational characteristics of the TRACECA – Aktau route

Routing: Poti (GEO) – Gardabani (GEO) – Boyuk Kasik (AZ) – Baku (AZ) – Caspian Sea – Aktau (KAZ) – Makat (KAZ) – Kandagash (KAZ) – Sary Agash (KAZ) – Almaty (KAZ) – Dostyk (KAZ)

Technical characteristics of the route

The TRACECA-Aktau route differs from the TRACECA – Turkmenbashi route only in its central station: from the Caspian Sea the route goes further through the Aktau port in

Kazakhstan and follows the Kazakh railways until Dostyk. From Makat station the TRACECA – Aktau route also follows the same pass as the Central corridor.

The total length of the route is 5,551 km, of which only half is double track and electrified. The loading gauge on the Georgian sections is T and in Azerbaijan and Kazakhstan it is 1-T. The maximum mass of the train in Georgia is 2,500 – 3,000t, depending on the route sections. In Azerbaijan and Kazakhstan the maximum mass is 2,800 t.

Table 67: Characteristics of the TRACECA – Aktau route by segments

Section of the route	**Country**	**Distance, km**	**Double track, km**	**Electrification**
Poti - Gardabani	Georgia	355	294,8	355 km with 3kV DC
Gardabani – Boyuk Kasik border crossing	Georgian – Azerbaijani border	Change of locomotive, customs clearance, border crossing control, technical inspection		
Bouyk Kasik - Baku	Azerbaijan	503	503	503 with 3kV DC
Baku – Aktau	Caspian sea ferry	463 km, Change of locomotive, customs clearance, border crossing control, technical inspection		
Aktau - Dostyk	Kazakhstan	4,190	1,256,3	790,4 with 3 kv DC, 25 kV AC 50 Hz
Total		**5,511**	**2,054,1**	**1,648,4 km with 3kV DC, 25kV AC 50Hz**

Source: OSJD Rail transport corridor n 10, 2010

In addition to the infrastructure improvement projects mentioned for the TRACECA – Turkmenbashi route and which are also relevant for the current route, the project of building a double track railway line between Beyneu and Jezkazgan is also of importance. This railway line will improve the connections of the Aktau port with the rest of the country. It will reduce the distance and travelling time significantly on the TRACECA-Aktau route (by about 1,000 km and 3-5 days of transit time), offering an additional alternative for crossing the country from East to West. The start and implementation of the project is expected between 2012 – 2016.

Another project that is important for RETRACK is the Aktau Port Expansion Plan. This project foresees the creation of a new basin to the North of the existing port. This extension will be used to build new oil berths, four berths for general cargo and containers and three support berths for smaller ships. The extension of the existing facilities will expand the total capacity of the port by 18 -19 mln tonnes of oil and 3 mln tonnes of general cargo. The construction works are planned to be finalised in 2020. A further extension plan foresees an expansion in the Southwestern part of the existing port facility. There is also a project for the construction of a Logistics Terminal within the extended Aktau port.

Main terminals on TRACECA – Aktau route

In addition to the above mentionned terminals in Georgia, Azerbaijan and Kazakhstan, there are two other freight yards of national importance along the TRACECA – Aktau route: the Kandyagash freight yard and the Aktau port and container terminal. The Atyrau and Aktobe container terminals are also located within a close distance.

The Aktau port is owned and operated by the Aktau International Sea Commercial Port State Enterprise. It has 12 berths, of which 2 berths are dedicated to general cargo/container terminals and of which only two berths have rail access. The existing equipment can handle 20' containers with a maximum of 10 T GW [130]. Both 28 and 52 wagon ferries can be loaded in the port. For a 52 wagon ferry the maximum wagon length is 14 metres.

The entire railway operation within the Aktau port, as well as the single line connection with the state railway network (3.5 km, till the Mangyshlak station) is provided by the private operator Kaskortansservice (KTS). At Mangyshlak station the remarshalling of all incoming trains takes place. Trains between Mangyshlak and the Aktau port stations run with a maximum of 35 wagons. The main line KTS capacity is dependent on the available amount of signaled track capacity and the locomotive driver and fleet. In 2009 KTS operated 6 locomotives, all of which were capable of moving the maximum trainloads on the system (42 wagons[131]) and were capable of shunting into terminals. Due to this gradient, the capacity of the Aktau-Beyneu railway line (single track on the entire stretch) is limited to 16-17 pairs of trains per day.

KTZ has plans to construct an independent rail access on its own network infrastructure to serve both the port and some of the oil terminals. This can reinforce the rail capacity of the port as well as contribute towards the decrease of the rail tariffs on these lines.

7.3 Strength and weaknesses: what potential clients thinks

7.3.1 Supply Chain Requirements for TRACECA rail corridor

Supply chain requirements for TRACECA rail routes are described in this section.

Shipment compatibility

Due to the historic reasons all the countries involved in the TRACECA railway corridors inherited the common operating standards, both for infrastructure and rolling stock. Therefore, intermodal transport can be organised on this corridor.

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130 The Motorways of the Sea for the Black Sea and the Caspian Sea, Thematic Railways report, July 2010, p 41

131 The Study for the project of the integrated logistics systems and marketing action plan for container transportation, JICA, December 2007

Lead time and lead time variability

Lead time describes how long it takes to deliver cargo on a specific route. Along the TRACECA railway corridors an even more important indicator appears to be “lead time variability”, which shows possible deviations from the promised lead time. Literature review and interviews provide some indications on time necessary to complete some sections of the TRACECA routes. Tables 68 and 69 present the overview and estimation of the time needed for the container block train to travel from Budapest (one of the possible connections with RETRACK) to the Dostyk/Alashankou border with China, using the TRACECA - Turkmenbashi and - Aktau rail corridors respectively.

Table 68: Lead time estimation for the container trains on TRACECA - Turkmenbashi route

TRACECA route section	Time, days
Customs, railway operations Poti	1 *
Railway Poti – Gardabani	1
Border crossing Georgia/Azerbaijan	6 hours
Boyuk Kasik – Baku	16 hours
Handling time in Baku	3*
Steaming Baku – Turkmenbashi	1
Handling time Turkmenbashi	3 *
Railway Turkmenbashi - Khodza Davlet	2 *
Border crossing Turkmenistan-Uzbekistan	3*
Railway Khodza Davlet – Sary Agash (Kazakhstan border)	3 *
Border crossing Uzbekistan – Kazakhstan	2 *
Sary Agash border – Dostyk/Alashankou (China border)	4 *
Border crossing Kazakhstan – China: Kazakh border crossing procedures China Customs and border crossing procedures: Express container train Regular container train Single wagon load	 5 hours 6 hours 10 hours 1 day
Total	**24**

*Source: The Motorways of the Sea for the Black Sea and the Caspian Sea, Thematic Railways report, July 2010; TERA international group, REG: Central Asia Regional Economic Cooperation Transport Sector Strategy Study, December 2008, Appendix 3, p. 136; * consultant estimations (based on the distances and average freight train speed of 200 km/day in the region); The Study for the project of the integrated logistics systems and marketing action plan for container transportation, JICA, December 2007, p. 4-113*

As Table 68 illustrates, it is estimated that the lead time for the single wagon load train from Poti to Alashankou, using the TRACECA – Turkmenbashi route, is a minimum of 24 days. It can be estimated that the block train can cover the same distance during 21 days.

Table 69 presents the lead time for the container transport on the Aktau route. It is estimated that container transport on the TRACECA – Aktau route with single wagon load train will take at least 26 days, with a block train – 24 days.

Table 69: Lead time estimation for the container trains on TRACECA - Aktau route

TRACECA – Aktau route section	Time, days
Handling time Poti	1 *
Railway Poti – Gardabani	1
Border crossing Georgia/Azerbaijan	6 hours
Boyuk Kasik - Baku	16 hours
Handling time in Baku	3*
Steaming Baku - Aktau	12 hours
Handling time/customs clearance Aktau	2
Aktau – Dostyk	18
Border crossing Kazakhstan – China:	
Kazakh border crossing procedures	5 hours
China Customs and border crossing procedures:	
Express container train	6 hours
Regular container train	10 hours
Single wagon load	1 day
Total	**26**

*Source: The Motorways of the Sea for the Black Sea and the Caspian Sea, Thematic Railways report, July 2010; TERA international group, REG: Central Asia Regional Economic Cooperation Transport Sector Strategy Study, December 2008, Appendix 3, p. 136; * consultant estimations (based on the distances and average freight train speed of 200 km/day in the region); The Study for the project of the integrated logistics systems and marketing action plan for container transportation, JICA, December 2007, p. 4-113, 4-99; WB, Implementation Status and Results. Azerbaijan, Rail Trade and Transport facilitation (27.03.2011)*

Reliability of the transit time is one of the weakest points on the TRACECA rail corridors. Even freight forwarders working in the region do not have basic information concerning transit time on the route between China – Kazakhstan and Azerbaijan[132]. This is due to the absence of an accurate schedule for rail transportation across the Central Asian countries and congestion which originates from the outdated infrastructure, lack of the rolling stock and other operational barriers. Container transport is mixed with the regular wagon deliveries and therefore, experiences additional delays. Moreover, in the majority of the TRACECA countries the present freight transport systems are still based on the method of the assembling and disassembling of freight cars at each freight yard. This is a cost-effective system for the supply side, but a very time-consuming system which decreases the time reliability of the overall service.

Below is a summary of some particular problems in different sections of the TRACECA rail corridors which impact the transit time on the overall corridor, as reported by rail corridor users within different studies and during interviews:

– Operation in Poti port: the access to the railway station from/to the port has a low speed,

132 The Study for the project of the integrated logistics systems and marketing action plan for container transportation, JICA, December 2007, A8-4

- Transit through Georgia: The frequency of the service and therefore delays can be affected by the lack of wagons, as experienced by the Georgian railways[133].
- Border crossing Georgia/Azerbaijan: border customs procedures are too long, with delays of up to 3h on each side[134]; when Azerbaijan changes the power supply voltage the change of the locomotives will become necessary at the border which will increase time;
- Transit through Azerbaijan: too many technical stops for changing locomotives and drivers (locomotives are changed for technical and operational reasons)[135]; In one section because of the high gradient two locomotives are required for the traction[136]
- Baku – Turkemenbashi ferry service: traffic handling capacity of the ports is unequal and procedures to regulate this are complicated which make the total transit time between Baku and Turkmenbashi ports unreliable;
- Turkmenbashi port: Lack of loading/unloading infrastructure makes Turkmenbashi port one of the major bottlenecks of the TRACECA corridor; ferries do not use the channel during windy sea conditions; there are no moving night vessels, because the lighting control systems needs modernisation; the rail marshalling yard has cranes with a limited lifting capability of only 5 tonnes;
- Transit through Turkmenistan: average freight train speed is very low, general railway capacity is limited by the infrastructure in place – all the railway infrastructure in Turkmenistan is single track and not electrified.
- Border crossing Turkmenistan – Uzbekistan: long customs inspection from the Uzbek side; borders are closed from time to time with no advance notice; operating hours of the Uzbek border crossing are not synchronised with the operating hours of the neighboring countries;
- Transit through Uzbekistan: The containers stand idle at the border crossing station Sary-Agatch awaiting formation of trains for a long time (up to10 days)[137].
- Border crossing Uzbekistan – Kazakhstan: long customs inspection from the Uzbek side; borders are closed from time to time with no advance notice; operating hours of the Uzbek border crossing are not synchronised with the operating hours of the neighboring countries
- Transit through Kazakhstan: to the greatest extent due to the obsolete infrastructure, the average speed of the freight train in Kazakhstan is 41 km/h138; there is no

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133 The Motorways of the Sea for the Black Sea and the Caspian Sea, Thematic Railways report, July 2010, p 25

134 Idem, p 19

135 Idem, p 7 indicates that "the abolition of the stops for changing the locomotive will reduce transit time of about 30 min per change".

136 Idem, p 16

International Logistics Centers/Nodes network in Central Asia, Task report A – Uzbekistan, September 2009, p 50 -51

138 The Study for the project of the integrated logistics systems and marketing action plan for container transportation, JICA, December 2007, p 3-15

accurate schedule for rail transportation across Kazakhstan and the number of days in transit can not be determined139);

- Border crossing Kazakhstan – PRC: loss of time because of too much time necessary for customs clearing procedures, too much time for station yard operations, approaching the capacity limit for loading facilities. Despite the bilateral agreement between Kazakhstan and the PRC, access within 90 km of the PRC is restricted. Documents are checked twice, in Dostyk and again In PRC.

The lead time deviation factor particular to the TRACECA-Aktau railway route is congestion which occurs on the Baku – Aktau ferry service. In particular, this is the case for the Baku port, as the traffic of wagons is mainly in the direction from Baku to Aktau. Congestion takes place because there are significant problems of coordination between the administrations of the ports Baku and Aktau, as well as between the ports and railway. Moreover, in the Aktau Port, Kascor Trans Service monopolises transportation on the line that links the Aktau Port Station and the Mandystau Station. Container cargo transportation does not receive priority and its time fluctuates from 6-8 hours to 1,5 days.

Generally railway transport in the TRACECA region is characterised by very frequent re-marshalling of wagons and too many changes of wagons and locomotives even within national borders. This introduces randomness into the times of passage of any particular wagon (CAREC strategy study, p 129). The considerable time loss at boundary stations is due to:

- a bad and untimely coordination between the railways, the customs, the forwarding agents and the customs brokers;
- the high number of documents required;
- long registration procedures with numerous state highly bureaucratic agencies;
- the absence or poor level of information technology means.

Price

The cost of the cargo delivery on the TRACECA rail corridors is a subject of several concerns. Price is often a function of distance and shipment size. In the TRACECA region price is also highly dependent on a number of countries involved in the cargo delivery, the number of borders to cross and the bilateral agreements between the countries. The parties within TRACECA signed a number of documents relating to certain benefits and reduced tariffs (e.g. a 50% discount on rail freight and ferry transportation of empty wagons; abolishment of taxes and fees on transit cargoes[140]). In practice, the composition of the rail tariff is not transparent and fluctuating tariff establishment is the general concern of all railway operators in the region therefore, making it nearly impossibe to make any reliable price forecast for the long term.

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139 The Study for the project of the integrated logistics systems and marketing action plan for container transportation, JICA, December 2007, A 8-7

140 Emerson M., Vinokurov E., Optimisation od Central Asian and Eurasian Trans-Continental Land Transport Corridors, Working paper 07, December 2009, p 10

In the TRACECA rail corridors countries tariff ceilings are negotiated and endorsed by the OSJD. The railway transit tariffs are set in accordance with the so-called MTT/ETT scale and are usually commodity and distance oriented. Each country has the freedom to offer discounts, as well as to set domestic rates. Therefore, it is a common practice to have a two-tier tariff structure: a tariff for international movements and a tariff for domestic movements which is largely discounted (sometimes 1/3 of the international tariff)[141]. In general, high transit tariffs appear to cross-subsidise domestic tariffs. Recently the Eurasec countries have ratified an agreement to unify the railway tariffs as from 1 June 2015. The railway tariff ceilings will be established in accordance with the national laws and international agreements. It is foreseen that before 1 January 2013 the Eurasec Member-States will unify railway tariffs within their countries (export, import and domestic railway tariffs) and as from January 2013 these unified tariffs will be used for the transit and domestic railways within the territory of each Member-State.

Furthermore, the structure and volume of rail transport tariffs are different from one country to another. As the MoS Feasibility study reports, carrying 20' container from Poti to Baku (863 km) with general cargo costs 569 USD, while the rail tariff from Aktau to Alamty (2910 km) is only 793 USD. In addition, the wagon handling/transit costs differ greatly between the ports: e.g. 230 USD/wagon at Poti, 70 USD at Baku, 600 USD in Aktau (MoS Feasibility study). Freight forwarders operating in the region indicate (JICA A 8-7) that tariffs are also subject to sudden changes and sometimes the rail tariff inconsistencies are observed within one country. For example, railway access to the Aktau port in Kazakhstan is controlled by an operator (KTS) different from KTZ (national railway company). Forwarders have to have two separate contracts, one for KTS and one for KTZ. Tariffs charged by KTS for the short route section of 15 km are considered to be very high and this discourages many of shippers from using the TRACECA-Aktau route.

In general, container rail transport in the TRACECA countries remains very expensive and there is a large gap between the tariffs for the carriage of the same goods in wagons in bulk or break-bulk and on platforms in containers (the latter being 2 to 4 times more expensive). Moreover, there is no single operator who is able to guarantee price all along the corridor therefore, the state railways only give rail tariff rates on national wagons and platforms.

Another problem with the TRACECA railways corridors pricing is the involvement of too many countries and, consequently, borders to be crossed on the route. The CAREC study (p 129) reports that complaints were heard that delivery of services from the railways sometimes requires illicit payment, for example to obtain tickets and to have wagons made available. The JICA (A8-6) study reports that in Kazakhstan informal costs (up to $50 US) are sometimes required in order to expenditure customs clearance. This significantly increases the final costs.

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141 TERA international group, REG: Central Asia Regional Economic Cooperation Transport Sector Strategy Study, December 2008, p. 96

Additional reasons which make the railway tariffs in the TRACECA region high are summarised in the MoS Railways report[142]:

- There is no consensus between the TRACECA countries on tariff matters and rebates to be applied for transit cargo;
- Georgia, being unable to guarantee the availability of wagons belonging to Central Asian countries at the time of shipment, is giving rates based on the use of Georgian wagons which include the return of the empty wagons to their depots in Georgia;
- The conditions of carriage, delivery at the final destination (including description of available technical facilities) and liability of the various parties involved remains unclear for the users.

Due to the above mentioned issues and in the absence of the price stability, freight forwards are rarely able to give any market price estimations for the full TRACECA rail corridors. Literature review provides us with some price estimations for the delivery of 20' containers following the TRACECA – Aktau route for 2007.

Table 70: Estimate of the container transport price for TRACECA - Aktau railway corridor, 2007

Section	Unit transport cost (US $/Container)	Transport Cost (US $/Container)
Urumqi - Dostyk	0,289	149
Dostyk - Aktau	0,328	684
Aktau - Baku	0,144	720
Baku - Poti	0,537	1,700
Poti - Rotterdam	0,256	1,800
Rotterdam - Berlin	0,600	720
Other costs		1,000
Total		**6,773**

Source: The Study for the project of the integrated logistics systems and marketing action plan for container transportation, JICA, December 2007, p 4- 92

Frequency of service

Information is available on the capacity of some of the railway segments and existing traffic (Table 71). The comparison between these two indicators gives a perception of the spare capacity and can provide an indication for the future frequency of service for the block trains on the TRACECA corridors.

142 The Motorways of the Sea for the Black Sea and the Caspian Sea, Thematic Railways report, July 2010, p 31

Table 71: Spare capacity for the freight on the TRACECA corridor, pairs trains/day

Name of the section	Maximum capacity freight train/day	Existing freight traffic train/day	Spare capacity freight train/day
Poti port: Container pairs train/day Bulk pairs train/day	 3-4 15	 1 9-10	 2-3 5-6
Poti - Boyuk-Kesik[143]	19	7-8	11-12
Boyuk-Kesik - Baku	45	33	6
Baku port railway freight station	17-18	5-9	8
Aktau port	16-17	10	6-7

Source The Motorways of the Sea for the Black Sea and the Caspian Sea, Thematic Railways report, July 2010, p 43, p 78; The Motorways of the Sea for the Black Sea and the Caspian Sea, Ports and Maritime Links, July 2010, p 2.

In regards to the Aktau port, even though theoretically spare freight train capacity exists, in reality the port is highly congested with wagons waiting to be discharged. The availability of the berth in the Aktau port is unpredictable and therefore, the rail ferry between Baku and Aktau is unreliable and has an irregular schedule. That is also a reason why CASPAR (the only ferry operator on this line) deploys 28 wagon line rail ferries on the Baku - Aktau line, whereas normally both the 28 and 52 wagon ferries can be loaded and unloaded at the Aktau port. The maximum wagon length is 14 meters for a 52 wagon ferry.

Another critical point for the TRACECA as well as for the Central and TransSib – Kazakh routes, is the capacity of the border crossing terminals between Kazakhstan and China, in particular the Dostyk terminal. There are large problems, such as lack of transshipment facilities and bogies or carts for containers and other general cargoes at the terminal. These shortages are limiting the Dostyk operation capacity.

Damages and theft

Low reliability of service and high risk of damages and theft of the cargo are the reasons which affect the shipper’s decision to transport their cargoes on the railways in the TRACECA region.

On the TRACECA railway corridors there is no unified information system that enables users to trace the location of their cargoes on the spot. Wagon tracking systems are occasionally improved but are still not automated. Therefore, there is no tracking and no service predictability.

143 This spare capacity is currently characterising the section Poti – Senaki. Other sections of the Georgian railway network have a higher spare capacity. For more detailed information on real and spare capacity for freight trains on the different Georgian sections of the TRACECA railway corridor, please see The Motorways of the Sea for the Black Sea and the Caspian Sea, Thematic Railways report, July 2010, p 78.

Some countries have started implementing automated information processing methods, within their territory however, these remain individual measures. In 2011 and in this framework The Freight Transportation branch of the «Georgian Railway» LLC introduced the on-line placement of orders for the freight transportation. When making an order for freight transportation, the client had to visit the "Georgian Railway" several times. Now, the procedure has been simplified and provides the client with better information.

The introduction of the wagon inventory and trace systems on the integrity of the TRACECA railway corridors will speed up processing and reduce the opportunity for fraud and corruption by reducing person-to person contact.

7.3.2 Major risks along the corridor

During the interviews with the users of the TRACECA - Turkmenbashi route, the following problematic areas of the corridor were identified, which affect the overall corridor performance (MoS Market approach, 2010, p.9):

- the corridor is not always safe;
- administrative rules and documentation (including Custom's and railways operators) are not clear, often changed, differing from one country to another and not easily accessible (even for local enterprises);
- obtaining quotations for transport costs is a difficult and time-consuming process, illegal payments vary and can not be budgeted;
- out of gauge cargoes cannot be moved via the corridor through Caucasus due to the gauge restrictions which entail the loss of complete contracts for local operators;
- costs are altogether higher than via other corridors and in particular with concern to rail tariffs;
- travel times are not fixed because they depend upon too many transport operators therefore, dates of delivery of cargo to the consignees cannot be scheduled as accurately as needed
- shippers and consignees have no access to information about their cargo location.

Another problem of the rail transport in Central Asia is the lack of basic information exchange about operational issues among the countries (JICA, A8-4). The corporations do not posses sufficient information to compile estimates on transit times, the types of infrastructure bottlenecks that exist, or the documentation requirements necessary to run rail transport through all the TRACECA countries. Therefore, they do not consider this route as a feasible option.

At the Poti, Baku, Turkmenbashi and Aktau seaports there are always risks that wagons will be unavailable.

In comparison to the Turkmenbashi route, the risks on the TRACECA – Aktau route are being reduced as fewer countries are participating in this corridor (and, therefore, there are less borders to cross). Nevertheless, the Aktau seaport capacity and operational problems are of a high concern for the supply chain operators on this route. As, additionally, TRACECA – Aktau route is longer and more time-consuming, she shippers still prefer Turkmenbashi route.

7.4 Operational and tehchnical barriers along the TRACECA corridor

TRACECA railway corridors are multi-modal and multi-country corridors, therefore their competitiveness depends a lot on the efficiency of the intermodal transport organisation and cross-border procedures.

7.4.1 Technical barriers

Technical barriers for the RETRACK – China connection via both the TRACECA routes can be summarised as follows:

- Different gauge with RETRACK countries and China (Europe, China – 1,435 mm, TRACECA corridor countries – 1,520 mm);
- Different electrical systems on separate segments: 3 kV DC, 25kv AC 50Hz, considerable amount of sections that are not electrified;
- Different signalling and control systems: not all of the sections of the railway corridor are equipped with automated control systems

Noteworthy to mention, is that when trying to improve the efficiency of its own railway system, some countries hamper the interoperability of the entire corridor. Azerbaijan plans to convert its electrification system to 25kV AC 50Hz, which will create further delays and bottlenecks at the Georgian – Azerbaijani border.

7.4.2 Operational barriers

Ferry transport transshipment operations, crossing multiple borders and different waybills and the freight liability regimes (more in detail describer in 13.1) are the main operational barriers for both the TRACECA corridor routes.

The railway systems within the TRACECA region use different waybills with different freight liability regimes. SGMS waybills used in the Central Asian region are not widely accepted by banks handling international commerce (CAREC strategy study, p 129).

Black Sea ferry transport

Several shipping lines provide ferry, Ro-Ro and container transport over the Black Sea and railway ferry lines are available between Poti and Iliychievsk, Varna, Batumi, Kerch, the Kavkaz port, Burgas and Novorossyisk. Batumi has rail ferry connections with Kerch, Varna and Ilyichevsk.

Table 72 summarises the freight ferry lines along the Black Sea that are relevant for RETRACK and have been operational since October 2011.

Table 72: Ferry Transport over Black Sea, October 2011

Service from/to	Service to/from	Frequency	Average sailing duration, hours	Operator	Capacity
Ilyichevsk	Batumi	1-2/w	50-60	NAVIBULGAR	108 waggons/900 cars/100 motor trucks up to 16m length operate the regular lines:
Ilyichevsk	Batumi	1/w	50-60	Ukrferry	50 wagons and 50 TIR
Ilyichevsk - Varna	Batumi	1/w	60 – 64	Ukrferry	108 wagons or 90 motor trucks up to 16 m length
Varna	Batumi	2-3/m	56-60	NAVIBULGAR	108 waggons/900 cars/100 motor trucks up to 16m length operate the regular lines:
Varna	Poti	1/w	56	NAVIBULGAR	108 waggons/900 cars/100 motor trucks up to 16m length operate the regular lines:
Kerch	Poti	1-2/m	20 - 30	NAVIBULGAR	108 waggons/900 cars/100 motor trucks up to 16m length operate the regular lines:
Kerch	Poti	1-2/m	20 - 30	Ukrferry	50 wagons and 50 TIR

Source: http://www.ferrylines.com/en/ferries/arrival///0/routes///4%2C5////GE/ , ports websites

The frequency of the service is only an indicative number. Sailing dates on the websites are preliminary and can usually be changed without notice beforehand.

There ferry connections are governed by specific bilateral and multilateral agreements:

– Agreement between the Ministries of Transport of Georgia and Ukraine on the “Joint operation and organisation of Ro-Ro transport between Poti (Georgia) and Illiychevsk (Ukraine),” signed in 1996;

– Agreement between Georgia, Bulgaria and Ukraine on the joint operation of ferry services between Varna, Poti/Batumi and Illiychevsk (signed in 1999 and revised in 2001);

– Agreement between Ukraine and Georgia on the organisation of direct International Ferry Traffic between Kerch and Poti/Batumi, signed in 2007.

Ferry lines between Constanza and the Poti/Batumi ports are currently not operational. They were terminated due to insufficient traffic volumes. Ideally these lines would provide the shortest connection for the RETRACK and TRACECA rail corridors therefore, within the implementation of the RETRACK corridor and the organisation of the massive traffic flows, the possibility to re-open the Constanza – Poti/Batumi railway ferry line needs to be discussed.

There are five railway ferry boats operating on these itineraries:

- Bulgarian ferry boats "Heroes of Odessa" (Batumi – Ilyichevsk line) and “Heroes of Sevastopol” (Varna – Batumi and Poti – Kerch lines) that operate with a capacity of the 108 rail wagons or 90 motor trucks each;
- Ukrainian ferry boats “Heroes of Shipka” (Kerch – Poti and Ilyichevsk – Poti lines) “Heroes of Plevna” (Ilyichevsk – Varna, Varna – Batumi lines) that operate with a capacity of the 108 rail wagons or 90 motor trucks each;
- The ferry boat "Greifswald" (Ilyichevsk – Batumi line) under the Georgian flag has the operating capacity of 50 wagons and 50 heavy vehicles.

The Ukrainian sea commercial port of Iliyvhevesk and Bulgarian port of Varna are the most important multimodal terminals for these ferry lines. Both terminals have all the necessary infrastructure and equipment. The port of Varna is the interconnectivity point with RETRACK’s main corridor and is the only place in the Black Sea region which has a rail ferry terminal with the possibility to change the rail car bogies from European to the Russian standard and vice-versa. The Varna Rail Ferry Complex is operated by the national shipping company Navigation Maritime Bulgare (Navibulgar) and the national company BDZ (the Bulgarian Railways).

The Georgian seaport Poti is an important terminal on the TRACECA route as it provides the connectivity of the corridor with Europe. All customs clearance, technical inspections and other border control procedures are performed here. The efficient functioning of the Poti port is crucial in order to increase the overall TRACECA corridor competitiveness. Currently, there are several bottlenecks that need to be removed. A number of these bottlenecks are[144]:

- the interconnectivity in the Poti seaport is not optimised because the unloaded wagons from vessels are moved to shipping line terminals and then back to the port rail station for the train set formation;
- a sinlge container is not allowed to be loaded on a double container rail platform, there should be two containers;
- de-stuffing of containerised goods into wooden box rail wagons;
- port berth availability is not predictable, therefore, operators can not book wagons beforehand.

However, freight forwarders, transport companies and shippers do not express any particular concerns about the Black Sea crossing.

[144] Poti to Baku and Turkmnebashi Transport Route, UNECE Euro-Asian Transport Route meeting, Turkmenbashi, 7 -8 December 2010

Caspian Sea ferry

The Russian Federation, Azerbaijan, Iran and Kazakhstan are operating vessels in the Caspian Sea. CASPAR - the Azerbaijani Caspian Shipping Company is a sole operator on the Baku – Turkmenbashi and Baku – Aktau lines. Within the ownership of CASPAR there are 80 vessels, of which 43 are tankers, 37 are Dry-cargo vessels (including 7 railway ferries and 4 Ro-Ro vessels). Two of the railway ferries have a 52 wagon capacity and the rest have a 28 wagon capacity.

Table 73: Ferry Transport in Caspian Sea, October 2011

Service from/to	Service to/from	Frequency	Average sailing duration, hours	Operator	Capacity
Baku	Turkmenbashi	2-3/w	12	CASPAR	52 wagons
Baku	Aktau	2-3/w	24	CASPAR	28 wagons

Source: The Motorways of the Sea for the Black Sea and the Caspian Sea, MoS Market Approach, July 2010, p 20 – 26, ports websites

The Caspian Sea crossing represents one of the major bottlenecks along the entire TRACECA railway route because of the non reliability of price and time.

A bilateral intergovernmental meeting between Azerbaijan and Kazakhstan was held in April 2009 and a draft Agreement for the transport of rail wagons via international direct and combined rail-ferry transport for Baku – Aktau – Baku was signed.

Almost 70% of CASPAR's activities are in the Caspian Sea. On the TRACECA railway corridor routes it does not face any competition which makes ferry service more expensive. In addition, the wagon handling/transit costs differ greatly between the Caspian Sea ports, making price-formation non transparent and non reliable. The MoS Feasibility report has indicated that wagon handling costs are almost 8 times higher in the Aktau port than in the Baku port.

The absence of the coordination in supply of the railway wagons to the ports between the railways of Azerbaijan, Turkmenistan and Kazakhstan make the Caspian Sea ferry crossing time very unreliable. It is impossible to establish fixed schedules for the rail ferries. The loading of ferries is done on the basis of the actual presence of the rail wagons and vehicles in the ports. The Turkmenbashi port only has 2 ramps, where one is usually loading the cargo and the other unloading the cargo. Very often congestion take places, due to more vessels in Baku loading in the direction of the Turkmenbashi port and overcapacitating this port. In these cases vessels remain berthed (sometimes for several days) and waiting for the return wagon load. This entails berthing delays for the next incoming vessels, accrued voyage expenses for the entire fleet, a much poorer rolling stock turnover with subsequent stock imbalance and possible equipment shortages at one end or the other end of the route[145].

[145] The Motorways of the Sea for the Black Sea and the Caspian Sea, MoS Market Approach, July 2010

The MoS study reports that high transit costs and unreliable transit times from Baku to Turkmenbashi and the customs rules making the clearance of partial shipments in wagons at final destinations very difficult, even induces some users (forwarders) to completely shunt the Central Corridor during the navigation period (April to October) and despatch their break-bulk cargoes on chartered sea-river vessels sailing from Turkey through the Black Sea, up the Don-Volga canal and then south across the Caspian Sea down to the Turkmen port.

The main business of the Aktau port is crude oil transportation together with grain supply and is given a clear priority. The rail ferries on the Caspian Sea from Baku to Aktau have no regular services. This is due to bad weather conditions and the fact that there is only one pier in Aktau. If this pier is occupied by an oil tanker, then the ferry has to wait, sometimes even up to 2 days before entering the port. Therefore, any increase in oil supply reduces the available capacity for the container traffic. Moreover, this increases the unpredictability of the availability of the berth at Aktau for container traffic and also results in CASPAR deploying services on the Baku – Aktau connection that are less economically viable (rail ferries with 28 wagon capacity only). The MoS report indicates that the Aktau port has great congestion problems with a high backlog of wagons awaiting discharge.

Another consequence of the absence of the regular container services on the Baku – Aktau route, is that the rail wagon also needs to cross the Caspian Sea, as the container cannot travel without a wagon. Sometimes container ships are chartered to transship the container without wagons, however, this is only viable when large numbers of containers are shipped. As was previously mentionend, the oil related wagons have priority of service. This makes it unpredictable for single wagon load wagons when they cross the Caspian Sea.

Multiple border – crossings

Although the customs officials are cooperating better, the Traceca route still involves several border crossings. As Russia and Kazakhstan are in the customs union, they have a competitive advantage over this route. Customs at the Russian-Kazakh border check only import and export but not transit wagons. There are less customs procedures, less time delays, less irregularities and less documents to prepare, whereas the Traceca route has customs at the Poti/Batumi port, the Georgian/Azeri border, Baku port and Aktau port.

Border crossing by rail in the TRACECA region is accompanied with complex operational processes and procedures. Several countries within the TRACECA railway corridor are actively working on the improvement of their customs procedures and introducing modern automated systems for customs clearance and centralised cargo management, as well as performing customs systems reforms. Projects for the reconstruction of the customs checkpoints in accordance with the international practices and including the “signle-window” concept, are on-going in Azerbaijan, Georgia and Kazakhstan. In order to improve the control on delivery and the processing of cargoes and to simplify customs clearance control, Uzbekistan started to operate a Unified Automated Information

System to control delivery and processing of cargoes with a special application for railways (UAIS-Railways).

There are bilateral and multilateral country agreements governing customs issues within the TRACECA region.

- Georgia and Azerbaijan have an Agreement on the Background in Customs Relations and an Agreement on the Customs Clearance of Transit Cargoes. Both were signed on 3 Februay 1933;
- Georgia and Kazakhstan have an Agreement that was signed on 1 June 1993
- Kazakhstan and Azerbaijan have an Agreement on the transit cargoes customs clearance and communication of customs authorities that was signed on 24 March 1993 and an Agreement on cooperation that was signed on 10 June1997
- Kazakhstan has Agreements covering customs issues with Turkmenistan (5 July 2001) and Ukraine (17 September 1999)
- Azerbaijan and Ukraine have signed an Agreement on cooperation within the customs sphere (24 June 1997); Azerbaijan and Romania have an Agreement on cooperation and mutual assistance in the field of customs issues, signed on 11 October 2004; Azerbaijan and Bulgaria have signed a Treaty of cooperation within the sphere of customs (02 December 1999)

Despite these measures and the existing customs and trade facilitation agreements, multiple border crossing is still a weak along the TRACECA railway corridor. The CAREC strategy study reports (p 132 app 3) that Central Asian countries have a general consensus on the causes of border crossing delays:

- poor transparency
- lack of harmonisation in customs procedures and entry requirements
- insufficient trust and jealousy
- protection of national interests over regional interests
- absence of regional transit agreements
- difference in standards between countries
- deficient infrastructure
- language problems
- legal barriers
- underdeveloped logistics and support services
- deeply entrenched requirements for unofficial payments

A number of forwarders and transport companies consider the Uzbekistan border crossings to be the most challenging. Long waiting times at borders and the frequency of "unofficial payments to various government officials" are the faced challenges that are most reported. The borders are only open during the day which reduces the customs operation time. Moreover, the working times are not coordinated with the working times of neighbouring states. Additional challenges are:

- Complicated customs laws and regulations, which conduct a non-uniform interpretation by different customs posts and different officers;
- Unpredictable times and closures of borders without any advance notice or further explanation;
- Mandated use of customs convoys when import cargo is destined to a point more than 300 km from the border. Forwarders report long waiting times for a convoy to be assembled, followed by a long road trip zigzagging from customs post to customs post that deviates from the shortest route to the final destination[146].
- Uzbek Customs examines 100% of the import cargo.

The Kazakhstan – PRC border crossing is another critical bottleneck for the TRACECA railway corridor border crossing point.

Organisation of container transport

Containers are mostly owned by the shipping lines. The container is expected to be returned within 10/14 days in the port of delivery. This means that the 'hinterland' transport, including unloading and returning, should be organised within this period, otherwise a fine will follow. This has implications for the Poti/Batumi – Baku transport. This cannot be organised by train within this period (800 km!) which means containers are taken by truck. In this instance, container transport to Central Asia via the TRACECA route is nearly impossible. It even occurs that the containers are stripped in Poti and the cargo is put in general cargo rail wagons; to reduce the risks of not returning. Insuring the risk of not returning the containers is also quite high.

The delivery time cannot be guaranteed, as currently container wagons are operated as single wagonload (a block train is foreseen from Poti to Baku) and the ferry services are irregular.

Containers for Central Asia (Kazakhstan) are mostly served via the Baltic ports. From these ports block trains run; which return the containers within 2 weeks. Another alternative is to put the containers on trucks to Central Asia, as the service time is much better under control and prices up until Baku are fractionally lower over the railways. However, the road transport takes 2 days and train transport takes 5 to 7 days. When the container has Baku as its destination then road and rail have the same price as the last mile is expensive and difficult to organise in Baku.

[146] Uzbekistan: Railway Modernization Project, ADB Completion Report, March 2008

Operation of wagons on the ferry

If a wagon is sent to Central Asia, it should return as well. When booking a ferry only return tickets are sold. However, return cargo usually is not available. Therefore, the wagon mostly returns empty. Within the rail network this is free of charge, but the ferry is not free of charge for empty wagons. This influences the shipping costs for containers. As mentioned before, it is not an option to have the wagon crossing the Caspian Sea as there are no regular container services. It is not an issue that wagons are not returned in time. This however, is a problem often mentioned when wagons are serving Russia.

7.5 Summary of the TRACECA corridor potential for RETRACK

In this chapter, two alternative TRACECA corridor routes were studied that provide the connection between Southern Europe and China:

- The TRACECA – Turkmenbashi route, which goes from Poti in Georgia, Azerbaijan, Turkmenistan and Uzbekistan and to Dostyk in Kazakhstan;
- The TRACECA – Aktau route, which goes from Poti in Georgia, Azerbaijan, the Aktau port in Kazakhstan and then further through Kazakhstan to the Dostyk border crossing with China.

Table 75 summarises technical and operational characteristics of both routes.

Table 75: Summary of technical and operational characteristics of the TRACECA – Turkmenbashi and TRACECA – Aktau corridor

Parameter	TRACECA - Turkmenbashi	TRACECA – Aktau
Distance, km	4,759,7	5,511
Double track, km	2,036,8	2,054,1
Electrified, km	2,088.2	1,648,4
Electrification systems	3kV DC, 25kV AC 50Hz	3kV DC, 25kV AC 50Hz
Gauge (mm)	1,520	1,520
Maximal axel load on the railway section (T)	23-25	23-25
Max train length (m)	1,000*	1,000*
Max train mass (T)	2,500 – 3,200	2,500 – 3,200
Loading gauge	T, 1-T	T, 1-T

** Information available only for some countries (e.g. Georgia, Kazakhstan)*

The maximum freight train speed varies on average from 60 – 80 km/h. On some sections of the TRACECA – Turkmenbashi route, due to the infrastructure condition, the train speed is limited to 20 - 40 km/h. The average freight train speed along both corridors is 40 km/h.

Both routes have a comparable infrastructure condition, only half of the distance is double track and they both alternate electrified and not electrified sections. The majority of the rail infrastructure in the Central Asian region dates back to the fully integrated networks of the Soviet Union. The capacity of the rail routes is considerably limited by the great amount of single track and non electrified sections and the general obsolete condition of the infrastructure and rolling stock.

There are a lot of different international initiatives which promote the development of the railway and road infrastructure in the region (as described in Chapter 2), as well as investment projects on the infrastructure rehabilitation. Considerable railway infrastructure improvements are in particular expected in Georgia, Azerbaijan and Kazakhstan. The planned construction of the Shalqar – Beyneu railway line in Kazahstan will decrease the distance of the TRACECA – Aktau route. The completion of the Khorgos – Saryozek section of the railway will shorten transit by 470 km for both of the routes. However, there are some investment projects that when implemented, will decrease the overall interoperability of the corridor (e.g. electrification of the Azerbaijani section with 25kV50HZ).

Due to the historic past, the operating system of the railway transport within the Central Asian countries is the same and there are no problems regarding shipment compatibility along the two researched TRACECA rail corridors. The service is also possible from the point of view of the existing freight traffic and available service capacity. In the majority of cases bottlenecks may occur, but are not due to the limited capacity of infrastructure but due to the mis-management or mis-operation of it. That is particularly relevant for the congestion in the Baku and (in regards to the traffic going to Turkmenbashi) Aktau ports. Therefore, the potential exists to open additional rail services.

At the same time both the TRACECA – Turkmenbashi and TRACECA – Aktau routes do not meet major supply chain requirements. The transit time is unreliable, market price is hard to assess and is not transparent and the risk of damages and thefts is very high.

In terms of distance, the TRACECA – Turkmenbashi route is shorter than the TRACECA – Aktau route. The low maximum speed on both routes increases the global cost and time of transportation. In addition, speed restrictions at stations need to be taken into consideration as at present, the container transport/block trains in Central Asia are intermingled with general freight and passenger transport. For these reasons, the estimated travelling times for the block trains on these routes are quite comparable, being 21 days for the Turkmenbashi route and 24 days for the Aktau route. In general, due to the vast amount of factors which contribute to the lead time variability, the lead time on both of the TRACECA routes is highly unpredictable.

The price of the transport on the TRACECA corridor is highly uncompetitive (and is very difficult to obtain for the entire Poti – Dostyk section). There is no consensus between the TRACECA countries on tariff matters and rebates to be applied for the transit cargoes. The conditions of the delivery and transshipment operations remain unclear and have a low reliability.

There are several technical and operational bottlenecks where RETRACK connects with China via the TRACECA rail routes. The following physical bottlenecks have been identified:

- change gauge twice

- different electrification and signalling systems
- a lot of manual operation on the railways
- the obsolescence and shortages of rail cars, containers and locomotives
- the non compliance of existing infrastructure and technology with international quality standards (route handling capacity)
- inadequate processing capacity at border crossing points;
- poorly developed logistics and communications networks
- the shortage of transshipment centres and insufficient handling capacity at border crossing points

Non-physical barriers are mostly related to the intermodal connections with two sea legs and multiple border crossings. The Caspian Sea is one of the major bottlenecks on the TRACECA route. The lack of coordination between the different transport modes, insufficient and unproportional infrastructure development in the ports and non transparent price formation make the Caspian Sea one of the most unreliable chains in the corridor. Other operational barriers are non harmonised transit tarrifs, random inspections which require sealed transit containers to be opened and a waybill system that is different from the European system.

In the short and medium term, the TRACECA - Turkmenbashi and the TRACECA – Aktau routes are comparable in terms of their infrastructure condition and the operational efficiency they provide.

8 Opportunities for the rail land bridges between Europe and China

In this chapter the economic potential of the rail land bridges between Europe and China has been assessed for the 4 main rail corridors, as has been determined in the previous chapters:

- **TransSib (TSR),** red line. This rail link begins in North Eastern China, going North directly into Russia. The Russian TSR ends in Moscow, from which the line continues further via Belarus to central Poland.
- **TransSib – Kazakh**, light blue line. This rail link starts in Western China, going via Kazakhstan in the North-Western direction. It joins the TSR line in Russia and follows the Trans Siberian corridor further.
- **Traceca - Turkmenbashi**, green line. This rail link starts in Western China, going via Kazakhstan, Uzbekistan and Turkmenistan. It crosses the Caspian sea, Azerbaijan, Georgia and crosses the Black Sea until finally entering Romania. In Romania it connects with the originally planned RETRACK corridor.
- **Central corridor**, brown line. This rail link starts in Western China, going via Kazakhstan in the Western direction and enters Russia in the South, then contunies via Ukraine and finally ending in Slovakia.

Furthermore, all of the corridors have been compared with the Deep Sea route and are highlighted in the corridor in dark blue.

The corridors are illustrated in Figure 17. The corridors in Figure 17 present rail and maritime links between China and the EU. These corridors implicitly include transport links to origins and destinations of physical goods flow. For instance, road transport might be used to bring containers to a rail terminal, where the goods are then loaded onto a train car. In addition we address the 27 EU countries and 4 Chinese regions separately to model various projected growth rates. The 27 EU countries and 4 Chinese provinces are independent sources and links for the flow of goods.

Figure 17: Rail land bridge corridor definition

8.1 Assessment method

The potential assessment presented in this chapter is made using the concept of the generalised logistics costs. The costs of transport between origin and destination points consist of two broad components. The first are the costs attributed to physical transport. This includes the costs of moving loading units (containers, bulk carriers) between loading and discharge points and costs of transshipment (deep sea terminal costs, rail terminal costs, etc). These are the so-called “out of pocket” costs that the cargo owners have to pay to move their goods.

The second cost component of the generalised logistics costs is related to the time that the goods spend in transit. For the cargo owners this time is often unproductive: they have already invested in production of the goods, but cannot realise the goods on the market. The goods in transit freeze capital, causing the so-called pipeline stock keeping costs.

However, the cost for capital that is frozen in transported goods is often not the greatest time-related cost component. While the goods are in transit, the market situation can change. Demand variability leads to capital expenditure on safety stocks that cover the uncertainty in demand during the period of transportation. Transit time also reduces company ability to react to other market events, such as introduction of new products by the competitors. In the case of new product introduction, the goods arriving later lose a substantial part of their value and are sold at a discount.

The time-related component of the generalised logistics costs can be summed up into the Value of Time (VOT) value. VOT values are commodity-specific, as some commodities such as raw materials and bulk goods generally have smaller VOT values. Finished goods, electronics and appliances tend to have a high VOT value. Moreover, the same commodities have different VOT values depending on the trade lane, i.e. value of time is dependent on the origin and destination of the goods. There is ongoing work to determine VOT values; the most recent estimations are used in the World Container Model (WCM)147. The model has been calibrated to reflect worldwide goods flows: the VOT values used in the model have thus been proven to be realistic estimates.

For the assessment of the rail land bridge potential we have computed the generalised logistics costs for the four studied rail corridors and the deep sea route. The assessment of the corridors is based on their economic attractiveness: the corridors with smaller generalised logistics costs will be more attractive for the cargo owners.

We use the discrete choice modelling technique to compute freight volumes for the corridors under consideration. Attractiveness of each of the corridors is determined by the generalised logistics costs: the lower this cost is, the more attractive a corridor becomes for the shippers. We used a logit148 model to approximate the choice behaviour of cargo owners / shippers. The volumes transported via a corridor are proportional to the total volumes between the trading partners and proportional to the probability that the corridor under consideration will be used.

For the objectives of this report, China has been split into 4 distinct regions, each having different growth prospects, economy properties, available infrastructure and various access costs to the Eastern deep sea ports. These 4 Chinese regions also have specific rail connections and distances to the European countries. Therefore, China was divided into Western China (CN1), Central China (CN2), Coastal China North (CN3), Coastal China Center / South (CN4). Table 76 provides information on what Chinese provinces constitute each of the four Chinese regions used in modelling. It also provides information over provincial GDP in nominal and purchasing power parity terms (source: National Bureau of Statistics of China).

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147 A strategic network choice model for global container flows: specification, estimation and application, Lóránt Tavasszy, Michiel Minderhoud, Jean-François Perrin, Theo Notteboom, Journal of Transport Geography, Volume 19, Issue 6, November 2011, Pages 1163–1172

148 The logit model is commonly used as an approximation to the economic principle of utility maximisation. That is, human beings strive to maximise their total utility. The logit form allows computation of probability that a certain choice will be made.

Table 76: Division of China into 4 economic regions and provincial GDP in real terms (x 100 mln) and at PPP (Purchasing Power Parity)

Chinese Province	Model regional division	2010 (CN¥)	2010 (US$)	2010 (PPP)	Share 2010 (%)
Mainland China		401,202	59,266	101,673	100
Guangdong	CN4, Coast	46,013,06	6,797,11	11,660,68	11,47
Jiangsu	CN4, Coast	41,425,48	6,119,43	10,498,09	10,33
Shandong	CN4, Coast	39,169,92	5,786,24	9,926,49	9,76
Zhejiang	CN4, Coast	27,722,31	4,095,18	7,025,42	6,91
Henan	CN2, Central	23,092,36	3,411,24	5,852,09	5,76
Hebei	CN4, Coast	20,394,26	3,012,67	5,168,34	5,08
Liaoning	CN3, Coast North	18,457,27	2,726,53	4,677,46	4,60
Sichuan	CN1, West	17,185,48	2,538,66	4,355,16	4,28
Shanghai	CN4, Coast	17,165,98	2,535,78	4,350,22	4,28
Hunan	CN2, Central	16,037,96	2,369,15	4,064,36	4,00
Hubei	CN2, Central	15,967,61	2,358,76	4,046,53	3,98
Fujian	CN4, Coast	14,737,12	2,176,99	3,734,70	3,67
Beijing	CN4, Coast	14,113,58	2,084,88	3,576,68	3,52
Anhui	CN2, Central	12,359,33	1,825,74	3,132,12	3,08
Inner Mongolia	CN1, West	11,672,00	1,724,20	2,957,93	2,91
Heilongjiang	CN3, Coast North	10,368,60	1,531,66	2,627,62	2,58
Shaanxi	CN2, Central	10,123,48	1,495,45	2,565,50	2,52
Guangxi	CN1, West	9,569,85	1,413,67	2,425,20	2,39
Jiangxi	CN2, Central	9,451,26	1,396,15	2,395,15	2,36
Tianjin	CN4, Coast	9,224,46	1,362,65	2,337,67	2,30
Shanxi	CN1, West	9,200,86	1,359,16	2,331,69	2,29
Jilin	CN3, Coast North	8,667,58	1,280,39	2,196,55	2,16
Chongqing	CN1, West	7,925,58	1,170,78	2,008,51	1,98
Yunan	CN1, West	7,224,18	1,067,17	1,830,76	1,80
Xinjiang	CN1, West	5,437,47	803,23	1,377,97	1,36
Guizhou	CN1, West	4,602,16	679,84	1,166,28	1,15
Gansu	CN1, West	4,120,75	608,72	1,044,29	1,03
Hainan	CN4, Coast	2,064,50	304,97	523,19	0,51
Ningxia	CN1, West	1,689,65	249,60	428,19	0,42
Qinghai	CN1, West	1,350,43	199,49	342,23	0,34
Tibet	CN1, West	507,46	74,96	128,60	0,13

The model performs computations for the 4 Chinese regions, linking the regions to each of the 27 EU countries. All trade and transport volumes go to / come from the “centers” of those 4 regions. We aggregate provincial-level economic data to the level of the 4 regions in China.

Two computation sets have been performed, one for the base year 2010 and one for the scenario 2020. Based on the model set up and model assumptions described in the following section, we make an estimation of the 2010 corridor volumes, answering the question on what would be the rail volumes in the current economic situation under the condition that the declared transit times (i.e. time that goods spend in transit) are adhered to. The scenario 2020 uses estimations over the expected trade growth between China and the EU-27, expected improvements in rail infrastructure and spatial changes in the Chinese economy for the coming decade.

8.2 Main assumptions

8.2.1 General model assumptions

The analysis results depend on the set of assumptions made for the purpose of this study:

- Corridor geographical definitions, as discussed in the previous section
- Regionalisation of the Chinese import / export towards the four distinguished regions in China, i.e. the share of each of the 4 Chinese regions in the trade flow between China and Europe. There is no data available on the Chinese trade at regional level. Therefore, we made assumptions over the share of the 4 Chinese regions in the trade with the European Union. These assumptions are based on the absolute size of the regional economies.
- Hard monetary corridor parameters: travel time in days, cost per tonne, per km, per transport mode, transshipment costs, border crossing costs and shadow costs. The shadow costs are not “out of pocket” costs but present a real resistance for the goods flow, as was shown in the previous studies.
- Value of time expressed in euro/day/tonne per NSTR commodity type. These values have been computed for the World Container Model (WCM).
- A route choice distribution parameter (value as calibrated in the WCM). This parameter defines how sensitive the cargo owners are to the price signals, which the generalised logistics costs give. For instance, in the utmost case, all goods would be sent through the cheapest transport option. On the other hand, cargo owners are indifferent to the price signals and divide all flows proportionally over all possible transport options. This parameter has been calibrated and validated in the WCM.
- The model estimates the average distances to and from each of the 27 EU countries to the European end points of the corridor. The same is also done for China: the distances to and from the 4 considered Chinese regions to the starting points of the corridors. The distances are used to determine the total logistics costs of transport to and from the rail corridors.

The following sections further detail the assumptions for the 2010 estimation and the scenario 2020 respectively.

8.2.2 Estimation 2010: main assumptions and parameters

There was a shortage of reliable origin destination data and a shortage of reliable data on the usage of rail corridors in 2010. Therefore, we have modelled corridor volumes for the year 2010. The model depends on a list of parameters defined in the tables below.

The shadow costs for each of the corridors are calibrated in order to get the most expected volumes that represent the 2010 distribution of volume between Europe and China. The shadow costs for maritime transport are set to 100 euro/tonne (which is about 1000-1500 euro per TEU container). Callibration of the WCM model has indicated that the TSR has a much larger resistance, making shadow costs multiple for maritime transport. The Central corridor and the TRACECA alternative need more transshipments and cross more borders, therefore they have even larger shadow costs. In addition, the travel time in days is based on an optimistic estimate, in other words, a properly functioning transport system.

Table 77 presents a regionalisation of trade between the EU and China for the year 2010. The share indicates what part of the total trade with European countries is attributed to a specific region.

Table 77: Regionalisation of trade between EU and China within Chinese regions for 2010

Chinese Region	Code	Share of import / export
Western China	CN1	0,05
Central China	CN2	0,05
Coastal China North (CN3)	CN3	0,45
Coastal China Center / South (CN4)	CN4	0,45

Table 78 presents model parameters for the year 2010; namely cost and transit time assumptions. The costs are in prices for the year 2010, which hold scenarios for both 2010 and 2020.

Table 78: Model parameters for 2010

Corridor	Code	Distance, km	Transit Time, days	Cost, Euro/tonne/ km	Euro/tonne (transshipment and shadow costs)
TSR	cor1	8,000	20	0,07	400
TransSib – Trans Kazakh	cor2	5,200	16	0,07	500
TRACECA - Turkmenbashi	cor3	5,400	40	0,07	900
Central	cor4	5,500	18	0,07	800
Maritime	cor5	16,000	30	0,0025	100
Transport to and from rail corridors				0.09	
Route choice					
Logit sensitivity parameter, mu	0,0045		Math.exp (-mu*GLC)		

Source: transit time is based on the RETRACK interviews with the stakeholders and expert opinion. Transshipment and shadow costs are based on expert opinions and model calibration runs. The sensitivity parameter is estimated during model calibration.

Table 79 presents the constant value of time for various commodity groups; we use constant VOT values for 2010 and 2020.

Table 79: Value of time of different commodity groups

NSTR	0	1	2	3	4	5	6	7	8	9
VOT (Euro/day/tonne)	3,8	5	1	3,4	2,6	7	1	1	7	8

8.2.3 Scenario 2020: main assumptions and parameters

For the 2020 scenario, we assume that the distribution of production in China will be shifted towards the Western and Central parts of the country. In addition, we assume that the trade between the EU and these regions will grow much faster than the trade between the EU and the coastal regions. The aggregated annual trade growth of 7% has been used, which translates into almost a doubling of trade volumes between the EU and China within a 10 year time frame.

Our further assumption is that the transit time between Europe and China on the rail corridors will improve. In addition, the tkm-tariff and shadow costs will also be reduced. These assumptions are all based on the proposed rail investments between 2010 and

2020. The shadow costs for the rail corridors are estimated to be lower than in 2010, reflecting expected improvements in infrastructure and service. The maritime shadow costs have been kept constant.

Table 80: Regionalisation of trade between EU and China within Chinese regions for 2020

Chinese Region	Code	Share of import / export
Western China	CN1	0,10
Central China	CN2	0,10
Coastal China North (CN3)	CN3	0,40
Coastal China Center / South (CN4)	CN4	0,40
Growth Factor (CN-EU trade) between 2010 and 2020		1,967151

Table 81: Model parameters for 2020

Corridor	Code	Distance, km	Transit Time, days	Cost, Euro/tonne/ km	Euro/ton (transshipment and shadow costs)
TSR	cor1	8000	14	0.035	300
TransSib – Kazakh	cor2	5200	12	0.035	400
TRACECA - Turkmenbashi	cor3	5400	25	0.035	650
Central	cor4	5500	12	0.035	400
Maritime	cor5	16000	30	0.0025	100
Transport to and from rail corridors				0.09	
Route choice					
Logit sensitivity parameter, mu	0.0045		Math.exp (-mu*GC)		

Source: transit time is based on the RETRACK interviews with the stakeholders and expert opinion. Transshipment and shadow costs are based on expert opinions and model calibration runs. The sensitivity parameter is estimated during model calibration.

8.3 Results – economic potential of the routes

We have performed model runs for each of the specified corridors using 2010 data and assumptions to acquire the results for the estimation of the 2010 corridor volumes. The model has been run for the scenario 2020 for each of the corridors. We have compared volumes of each of the rail corridors to the maritime corridor, assuming that there is no competition between the rail corridors, i.e. only one rail corridor was assumed to be operational. We have further looked at the situation where the rail corridors are competing for the volumes, not only with the maritime corridor, but amongst themselves as well.

Each scenario outcome is presented as a figure, where volume is split between deep see and the rail corridor under consideration per NSTR/1 commodity group (Table 82 provides information over NSTR/1 commodity classification). We also provide an indication over the direction of the flows.

Table 82: Overview NSTR/1 commodity classification

NSTR/1 code	Commodity type
NSTR0	Agricultural products and live animals
NSTR1	Foodstuffs and animal fodder
NSTR2	Solid mineral fuels
NSTR3	Petroleum products
NSTR4	Ores and metal waste
NSTR5	Metal products
NSTR6	Crude and manufactured minerals, building materials
NSTR7	Fertilizers
NSTR8	Chemicals
NSTR9	Machinery, transport equipment, manufactured and miscellaneous articles

8.3.1 TransSib – Manchurian route

Figure 18 and table 83 provide information on the estimated volumes in 2010 over the Trans Siberian rail line to and from the 27 EU countries and China. We estimate that under the condition of a reliable lead time, the Trans Siberian rail line had the potential to transport 1,43% of the total goods flow between the EU 27 and China in 2010. This estimation does not include an impact of other rail corridors; the impact of intra-rail corridor competition is very limited for the 2010 situation, due to rather small volumes carried out by rail.

Figure 18: Estimated 2010 TSR and maritime volumes between EU 27 and China

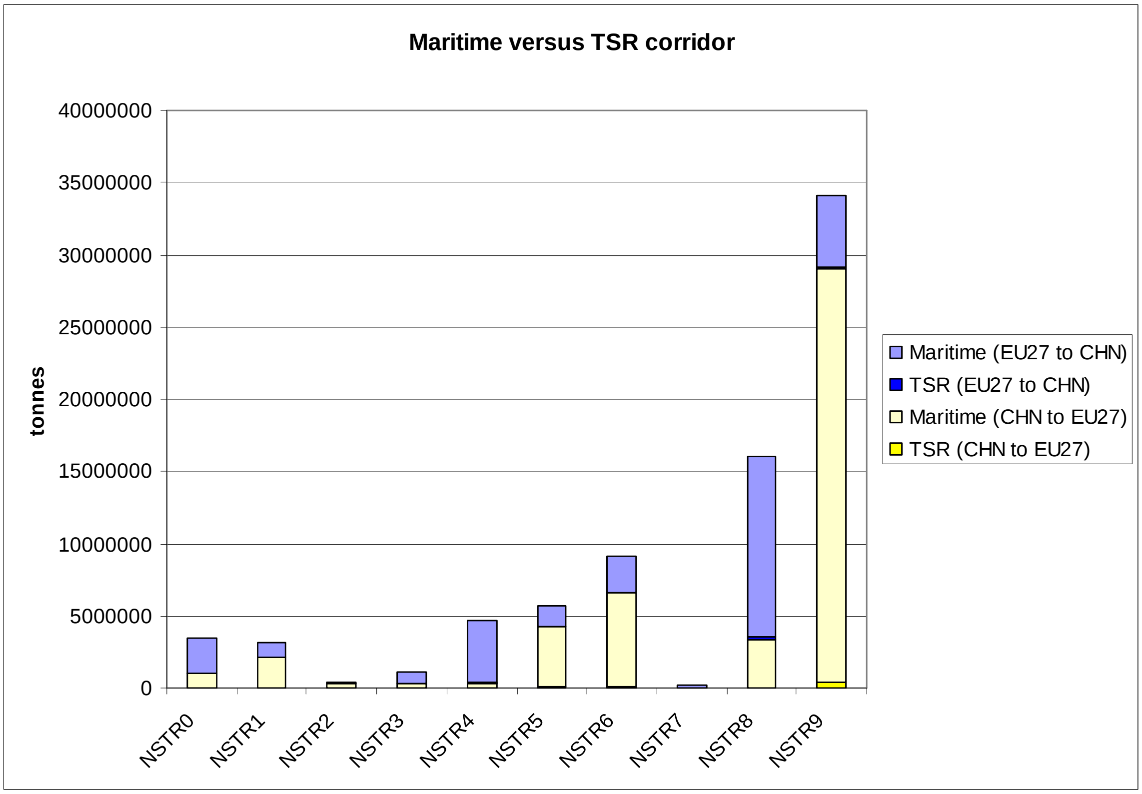

Table 83: Summary of estimated 2010 TSR and maritime volumes between EU 27 and China

	To Europe	To China
TSR volume, tonne	687,501	429,754
Maritime volume, tonne	46,774,889	30,105,878

Figure 19 and Table 84 provide the results for scenario 2020 for the TransSib rail line to and from the 27 EU countries and China under the assumption of no competition from other rail corridors (the competition factor is considered later in the report). The TSR shows a good potential to substantially increase the volumes. We estimate that the TSR line can carry 9,24% of the ton trade volume between Europe and China, thus increasing the market share of TSR by more than 500%. In absolute terms, this means an increase by almost factor 10.

Figure 19: Scenario 2020 TSR and maritime volumes between the EU 27 and China

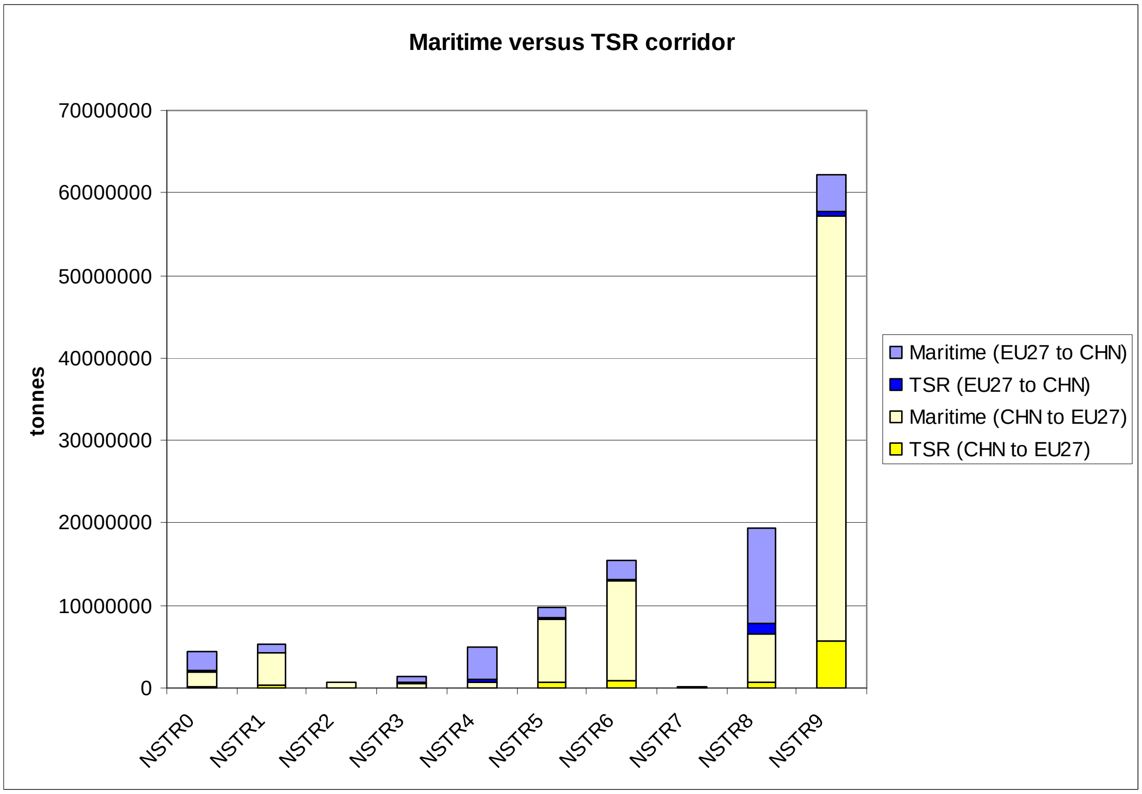

Table 84: Summary of scenario 2020 TSR and maritime volumes between EU 27 and China

	To Europe	To China
TSR volume, tonne	8,721,143	2,722,931
Maritime volume, tonne	84,644,562	27,812,701

8.3.2 TransSib - Kazakh route

Figure 20 and Table 85 provide information on the estimated volumes in 2010 over the Kazakh rail corridor to and from the 27 EU countries and China. We estimate that under the condition of a reliable lead time, the Kazakh rail corridor had the potential to transport 1,60% of the total goods flow between the EU 27 and China in 2010. This estimation does not include an impact of other rail corridors; the impact of intra-rail corridor competition is very limited for the 2010 situation, due to rather small volumes carried out by rail.

Figure 20: Estimated 2010 Kazakh rail link and maritime volumes between EU 27 and China

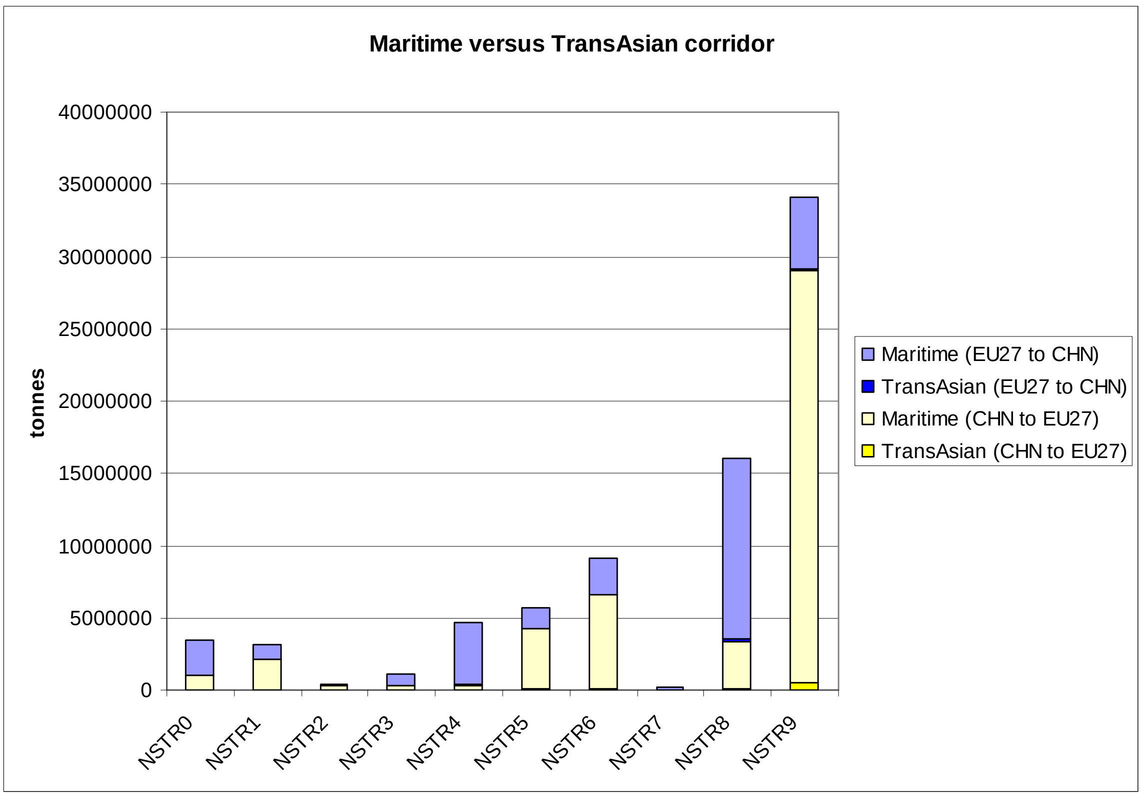

Table 85: Summary of estimated 2010 TransSib – Kazakh rail link and maritime volumes between EU 27 and China

	To Europe	To China
TransSib – Kazakh volume, tonne	770,245	476,664
Maritime volume, tonne	46,692,145	30,058,968

Figure 21 and Table 86 provide the results for scenario 2020 for the Kazakh rail corridor to and from the 27 EU countries and China under the assumption of no competition from other rail corridors (the competition factor is considered later in the report). The Kazakh corridor has a good potential to increase the volumes, although it is smaller than in the case of TSR. We estimate that the Kazakh rail corridor can carry 7,42% of the tonne trade volume between Europe and China, thus increasing the market share of the Kazakh corridor by more than 360%. In absolute terms, this means an increase by 635%.

Figure 21: Scenario 2020 TransSib – Kazakh rail corridor and maritime volumes between EU 27 and China

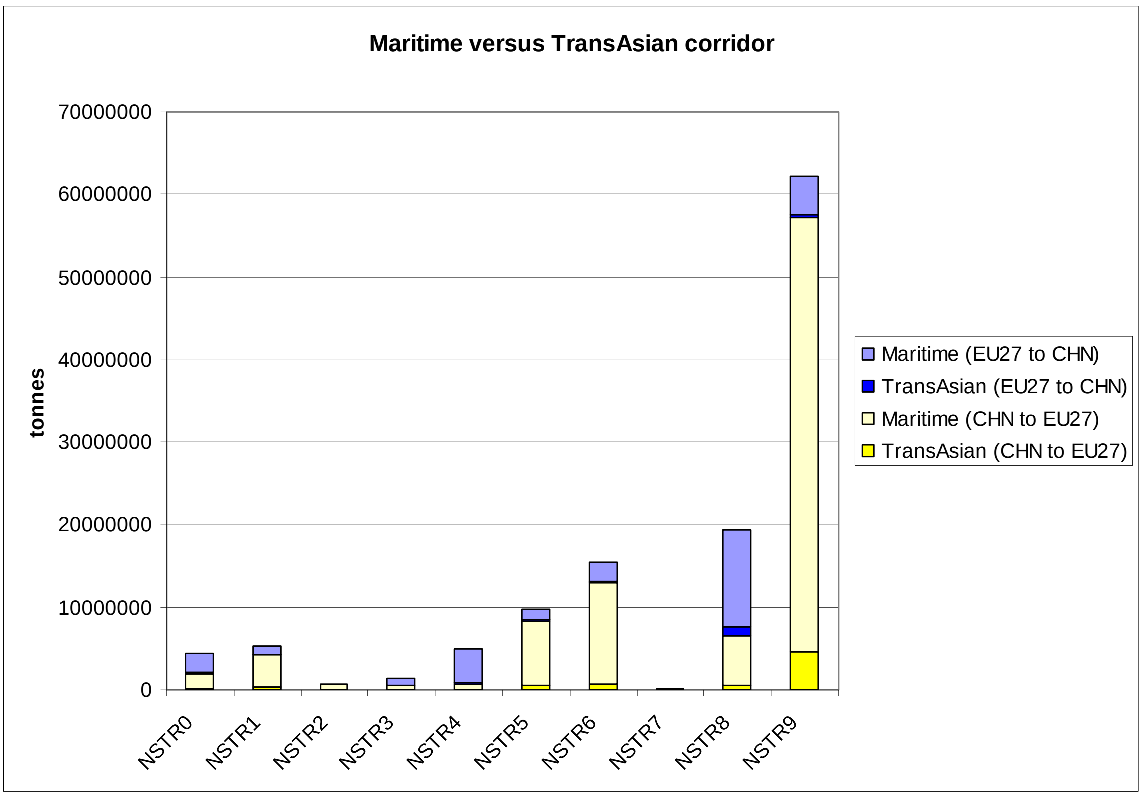

Table 86: Summary of scenario 2020 TransSib - Kazakh rail corridor and maritime volumes between EU 27 and China

	To Europe	To China
TransSib – Kazakh rail corridor volume, tonne	7,008,325	2,187,534
Maritime volume, tonne	86,357,380	28,348,098

8.3.3 TRACECA – Turkmenbashi route

Figure 22 and Table 87 provide information over the estimated volumes in 2010 for the TRACECA rail corridor to and from the 27 EU countries and China. We estimate that under the condition of a reliable lead time, the TRACECA rail corridor had the potential to transport 0,13% of the total goods flow between the EU 27 and China in 2010. The TRACECA corridor has the lowest rail volumes among the four studied rail corridors. This is mainly due to a vast number of border crossings and transhipments, which negatively impact the transport time and costs. This estimation does not include an impact of other rail corridors; the impact of intra-rail corridor competition is very limited for the 2010 situation, due to rather small volumes carried out by rail.

Figure 22: Estimated 2010 TRACECA rail corridor and maritime volumes between EU 27 and China

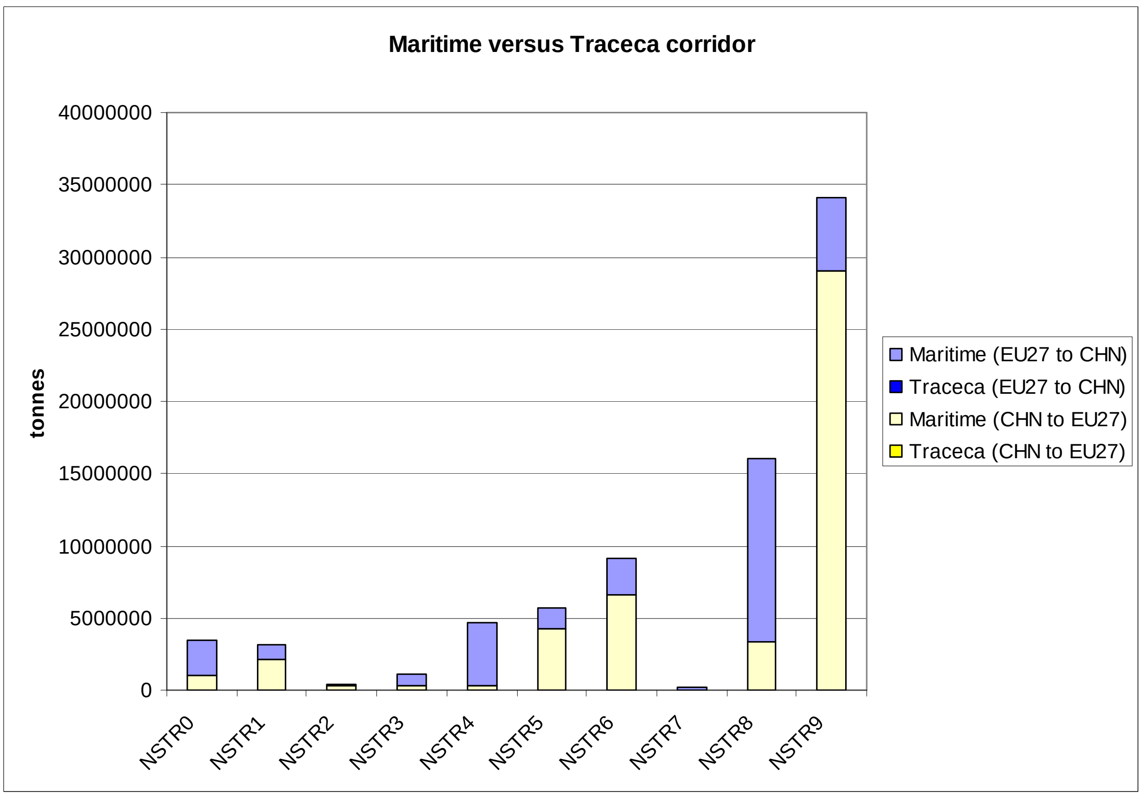

Table 87: Summary of estimated 2010 TRACECA rail corridor and maritime volumes between EU 27 and China

	To Europe	To China
TRACECA rail corridor volume, tonne	62,279	41,034
Maritime volume, tonne	47,400,111	30,494,598

Figure 23 and Table 88 provide the results for scenario 2020 for the TRACECA rail corridor to and from the 27 EU countries and China under assumption of no competition from other rail corridors (the competition factor is considered later in the report). The TRACECA corridor has a strong potential to increase the volumes, although this increase is to be realised from almost non-existing volumes in 2010. We estimate that the TRACECA rail corridor can carry 1,89% of the tonne trade volume between Europe and China. However, the vast number of transhipments and border crossings still makes TRACECA less attractive than the other corridors considered.

Figure 23: Scenario 2020 TRACECA rail corridor and maritime volumes between EU 27 and China

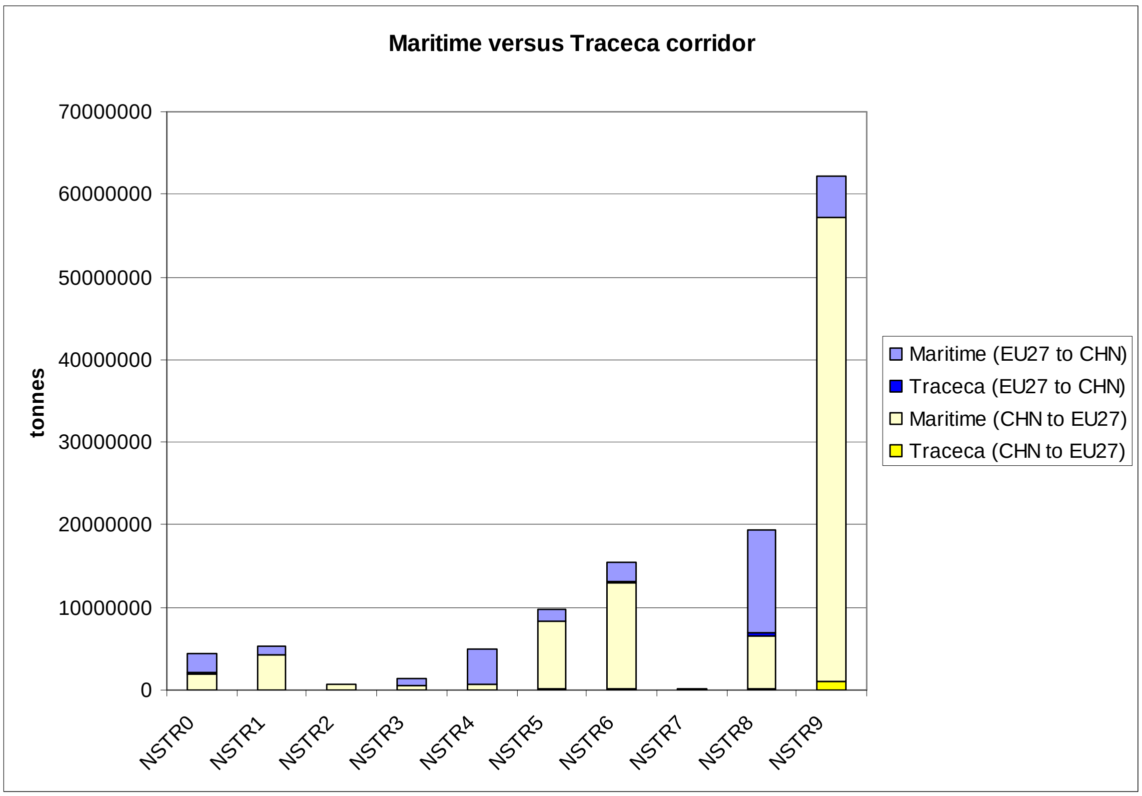

Table 88: Summary of scenario 2020 TRACECA rail corridor and maritime volumes between EU 27 and China

	To Europe	To China
TRACECA corridor volume, tonne	1,777,252	563,325
Maritime volume, tonne	91,588,453	29,972,307

8.3.4 Central corridor

Figure 24 and Table 89 provide information over the estimated volumes in 2010 for the Central rail corridor to and from the 27 EU countries and China. We estimate that under the condition of a reliable lead time, the Central rail corridor had the potential to transport 0,29% of the total goods flow between the EU 27 and China in 2010. The Central rail corridor has small rail volumes, mainly due to infrastructure effects in 2010. This estimation does not include an impact of other rail corridors; the impact of intra-rail corridor competition is very limited for the 2010 situation, due to rather small volumes carried out by rail.

Figure 24: Estimated 2010 Central rail corridor and maritime volumes between EU 27 and China

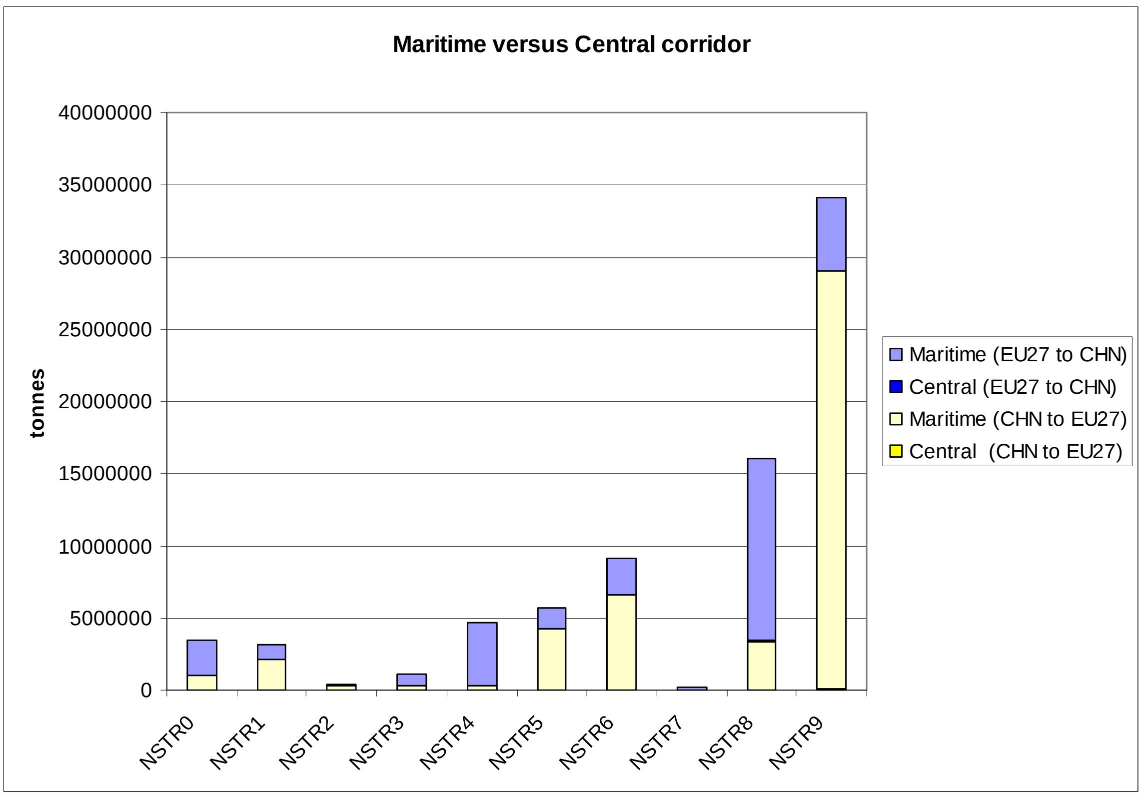

Table 89: Summary of estimated 2010 Cenral rail corridor and maritime volumes between EU 27 and China

	To Europe	To China
Central corridor volume, tonne	138,918	83,690
Maritime volume, tonne	47,323,472	30,451,942

Figure 25 and Table 90 provide the results for scenario 2020 for the Central rail corridor to and from the 27 EU countries and China under the assumption of no competition from other rail corridors (the competition factor is considered later in the report). The Central rail corridor has a strong potential to increase the volumes, although this increase is to be realised from small volumes in 2010. We estimate that the Kazakh rail corridor can carry 5,74% of the tonne trade volume between Europe and China. The Central rail corridor is different from the TRACECA corridor in a sense that it can increase the volumes that are comparable with those of the TSR and Kazakh corridor values. This is due to the fact that this corridor is inherently simpler than TRACECA: transshipments between transport modes are not necessary, nonetheless the rail infrastructure along the route must be substantially improved.

Figure 25: Scenario 2020 Central rail corridor and maritime volumes between EU 27 and China

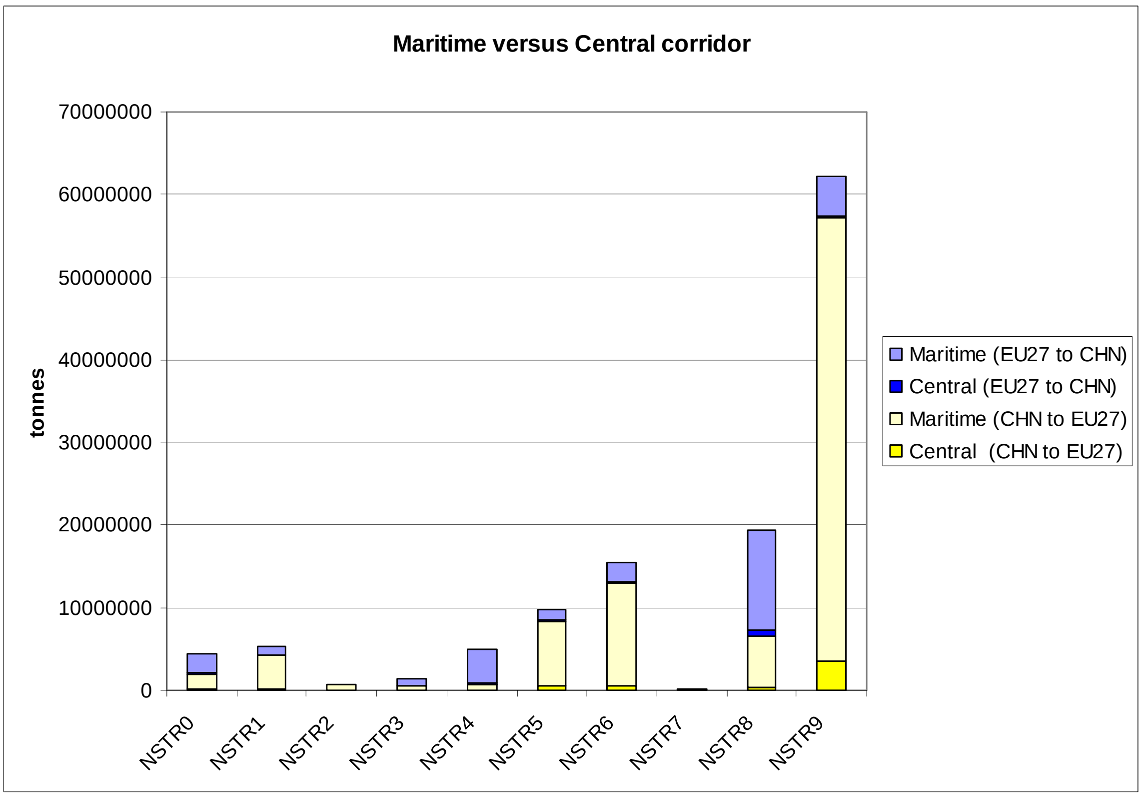

Table 90: Summary of scenario 2020 Central rail corridor and maritime volumes between EU 27 and China

	To Europe	To China
Central corridor volume, tonne	5,457,077	1,651,820
Maritime volume, tonne	87,908,627	28,883,812

8.3.5 All corridors are competing

In the previous section we considered the corridors separately, without taking into account the inter-rail corridor competition. In assuming constant trade volumes between the EU 27 and China, a greater number of transport route options would lead to a wider spread of the volumes between the corridors. If there were initially only the maritime and TSR corridors, an addition on the Kazakh corridor would take volumes from both the maritime and TSR corridors. Below we analyse how inter-corridor competition would impact the volumes over each of the corridors.

Figure 26 and Table 91 provide information over the estimated volumes in 2010 for all rail and maritime corridor to and from the 27 EU countries and China, under the assumption of inter-rail corridor competition. The results do not differ much from the estimations, which did not take into account rail corridor competition. This is mainly due to low rail volumes in 2010. The low volumes imply that inter-corridor competition does not have a large impact, as the corridors “do not see” each other

Figure 26: Estimated 2010 rail corridor and maritime volumes between EU 27 and China under assumption of rail corridor competition

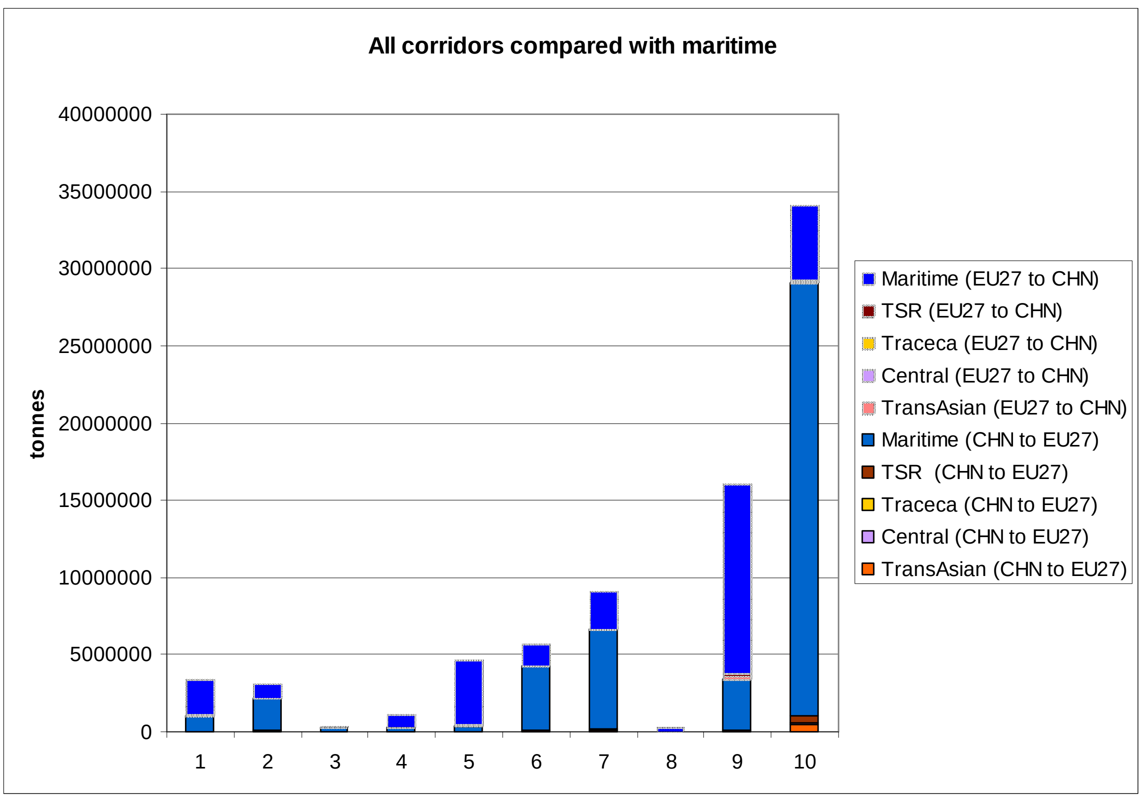

Table 91: Summary of estimated 2010 rail corridor and maritime volumes between EU 27 and China under assumption of rail corridor competition

	To Europe	To China
TSR corridor, tonne	669,325	418,845
TransSib - Kazakh corridor, tonne	747,150	462,866
TRACECA corridor, tonne	57,545	38,066
Central corridor, tonne	128,844	77,868
Maritime corridor, tonne	45,859,526	29,537,987
Total	47,462,390	30,535,632

Figure 27 and Table 92 provide the results for scenario 2020 for all rail corridors and maritime corridors to and from the 27 EU countries and China, under the assumption of inter-rail corridor competition. Contrary to the 2010 estimated situation, the competition would have an effect on rail volumes. For instance, the share of TSR would decrease from 9,24% to 7,89% of the total EU-China transport volume, thus effectively decreasing by 14,6%. The volume on the TRACECA corridor would decrease from 1,89% to 1,25% of the total volume, thus effectively decreasing by 33,9%. It is plausible to conclude that weaker corridors would be more strongly affected by the intra-rail competition than the more attractive ones corridors.

Figure 27: Scenario 2020 rail corridor and maritime volumes between EU 27 and China under assumption of rail corridor competition

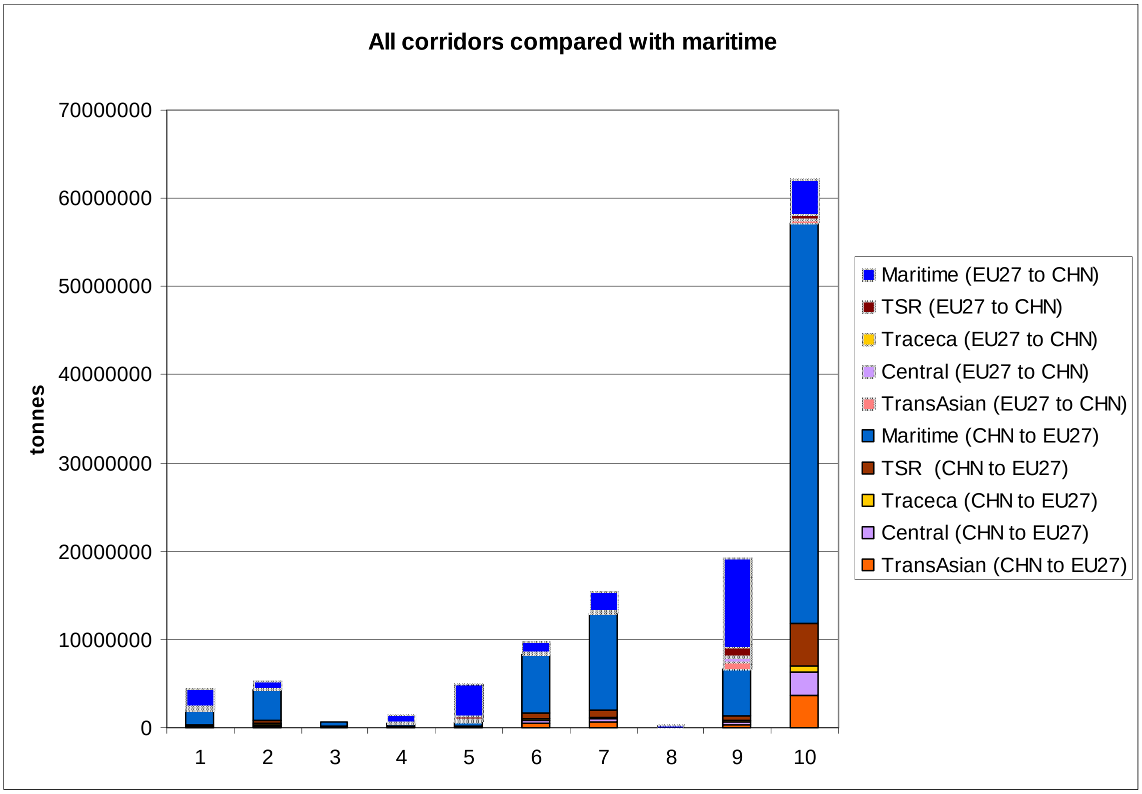

Table 92: Summary of scenario 2020 rail corridor and maritime volumes between EU 27 and China under assumption of rail corridor competition

	To Europe	To China
TSR cooridor, tonne	7,438,181	2,338,715
TransSib – Kazakh corridor, tonne	5,520,081	1,741,234
TRACECA corridor, tonne	1,171,637	379,233
Central corridor, tonne	4,085,516	1,245,774
Maritime corridor, tonne	75,150,290	24,830,675
Total	93,365,705	30,535,632

8.4 Summary and conclusion on the economic potential of the RETRACK – China corridors

A model based analysis of the 4 rail corridors was conducted in order to assess the current (2010) and future (2020) attractiveness of these corridors for the delivery of cargo by rail from Europe to China. In Table 93 the results are summarised. For each of the scenarios, namely for the years 2010 and 2020 and for the cases of inter-rail corridor competition and with the absence of competition, we present the share of the total volume (i.e. proportion of the total EU-China trade volume carried out by the corridor under consideration) that would be carried out through the corridor (the total trade volume does not include air transport volumes, which are relatively small and do not have a considerable impact on scenario results). The presented shares are the shares of the total trade volumes in both directions, the EU-27 to China and China to the EU-27.

Table 93: Share of each corridor in the total transport volume between EU-27 and China, in both directions, including rail and deep sea

Scenario / year	Corridor			
	TSR	**TransSib - Kazakh**	**TRACECA**	**Central**
2010- no competition	1,43%	1,60%	0,13%	0,29%
2020- no competition	9,24%	7,42%	1,89%	5,74%
2010- competition	1,40%	1,55%	0,12%	0,26%
2020- competition	7,89%	5,86%	1,25%	4,30%

In 2010 the TSR and Kazakh corridors are the most attractive options, with the Kazakh corridor being slightly more attractive then TSR. The TRACECA and Central corridors are not a viable option. In 2020, the TSR will remain the most attractive rail land bridge, while the Kazakh land bridge will slightly lose its attractiveness. The most important expectation for 2020 is that the Central corridor will also become a good transport option, not being far behind the leading corridors.

The increased competitiveness of the TSR corridor in 2020 can be explained by the fact that this corridor has the fewest number of border crossings and transshipments. Even assuming favourable developments in respect to infrastructure and alleviation of institutional barriers, border crossings and transshipment will still add extra transit time and costs. The extra times and border crossings are a structural resistance factor. Nonetheless, these extra expenses will not deter a substantial goods flow growth.

If the inter-corridor competition is taken into account then in 2010 we do not observe a real competition between them. In other words, the rail volumes are so small that the corridors do not compete with each other and take the volumes from the maritime corridor. However, with the expected volume growth in 2020 the competition between the corridors will become sizable and not all volumes will be taken from the deep sea route. The impact of competition is in the range of 17% to 50% volume loss to competition. However, this would not occur if competition did not exist. In other words, rail corridors would take cargo from each other. The less attractive corridors such as TRACECA would lose relatively more volumes to the more attractive corridors.

It should be noted that the substantial volume growth for the rail land bridges (we are talking about approximately a 5-time relative increase of the market share for rail) depends on the proper development of the rail sector and the removal or alleviation of the physical and institutional barriers. If there are no actions taken in infrastructure development (rail, terminals), legislation is not tackled, customs and bureaucratic barriers are not sufficiently dealt with, then these estimations will not be realised.

However, the work on policies and investment plans, as well as in depth interviews with the key players in the market, described in RETRACK D13.1, gives us sufficient confidence that the model assumptions are good for the estimation of rail land bridge volumes in 2020.

9 Comparative analysis of the linking RETRACK with China through Trans-Siberian, Central-Kazakhstan and TRACECA rail corridors.

In this chapter the overall connections between RETRACK and China are compared: the corridors are compiled with interconnection options and destination points in China. The overall routes are further compared according to the selected parameters: distance, time and the main technical and operational barriers.

The comparison is focused on the pre-selected interconnections and routes in the previous chapters. For the Northern part of RETRACK, Duisburg is considered as the most optimal interconnection point. This is currently a hub with which the regular container traffic with China has already been organised. Connecting the Southern part of RETRACK with China is offered through three main options: Budapest, Bucharest and Bratislava. As was identified in Chapter 3, Bratislava and Budapest will compete in the future to be the main RETRACK connection points for the studied corridors. For the sake of comparison, the shortest route in each particular case is chosen, both in terms of km travelled and average transit time. As the deliverable is focused on the connection of RETRACK with the Western Chinese provinces, Lanzhou was chosen as a final destination for all of the routes.

The chapter is structured in order to provide the comparison of the route options for two target regions: connecting the Northern and the Southern parts of the RETRACK with China. The routes are compared upon their technical characteristics, which include infrastructure and rolling stock conditions and technical barriers on the route and on their operational characteristics, which are supply chain requirements and main operational barriers of the routes.

9.1 Connection of the North of RETRACK with China

There are three main options of the Northern RETRACK connection with China: the TransSib – Kazakh, the TransSib – Mongolian and theTransSib – Manchurian routes. All three routes are already using the functioning and well established Trans-Siberian corridor in Russia.

9.1.1 Comparison of technical characteristics and barriers

All three routes are in comparable technical condition and use the same interconnection with RETRACK (Duisburg – Moscow), which is fully electrified and double track. Furthermore, the infrastructure of the TransSib main line and branch lines also provide mainly double track and electrified sections. The main infrastructure bottlenecks on the TransSib – Kazakh route are non electrified and single track sections in Kazakhstan and over some Chinese sections until Lanzhou. Over the entire Mongolian section, which is 1,111 km, single track and non electrified for the TransSib – Mongolian route, some sections along the Chinese route until Lanzhou are similar to that of the Mongolian section. Finally, the main infrastructure bottleneck on the TransSib – Manchurian route is the section of the route through the Zabaykalsk region (mostly along the large and small rivers in a difficult low-mountain terrain, with some segments requiring the encouraging locomotives) which is the non electrified and single track section of the Chinese route. Table 94 provides a more detailed summary of these routes.

Table 94: Technical characteristics of the RETRACK – China northern connection

Sections of the route	Distance, km	Double track, km	Electrified, km*
TransSib – Kazakh route			
Duisburg - Moscow	2,363	2,363	2,363 with 3kV DC and 25kV AC 50Hz
Moscow – Dostyk	4,353	3,514	3,514 with 3kV DC and 25kV AC 50Hz
Dostyk – Lanzhou	2,402,3	1,676	295 with 25kV AC 50Hz
Total Duisburg Lanzhou	**9,118,3**	**7,553**	**6,172**
TransSib – Mongolian route			
Duisburg - Moscow	2,363	2,363	2,363 with 3kV DC and 25kV AC 50Hz
Moscow – Zamyn Uud	7,021	5,654	5,649 with 3kV DC and 25kV AC 50Hz
Zamyn Uud – Lanzhou	2,645	1,781	1,857 with 25kV AC 50Hz
Total Duisburg Lanzhou	**12,029**	**9,798**	**9,869**
TransSib – Manchurian route			
Duisburg - Moscow	2,363	2,363	2,363 with 3kV and 25kV50Hz
Moscow – Zabaykalsk	6,660	6,442,4	6,442,4 with 3kV and 25kV50Hz
Zabaykalsk – Lanzhou	4,033	3,579	3,042 electrified with 25kV50Hz
Total Duisbrug – Lanzhou	**13,056**	**12,384,4**	**10,201,2**

** This section gives and approximate amount of electrified lines, which was available from the literature review.*

The TransSib – Manchurian route connects RETRACK with China following the traditional Trans-Siberian railway along the majority of the route. Currently, this is the second most frequently used route to deliver goods from Europe to China, after the Deep Sea route. In a lot of cases the final destination of cargo is in the Eastern part of China, and, in particular, Beijing. In addition, cargo is also distributed to the more remote destinations in China.

On the TransSib - Kazakh route, the maximum train length is 1,000m and the maximum train mass is 2,800 t. The maximum axel load on the Russian sections is 25t and 23t on the Kazakh sections. The loading gauge of the entire route is: 0SM, 1 SM and 2 SM within the Polish territory, T and 1-T on the Belarus, Russian and Kazakh railways and 4,800 mm in China. The TransSib – Mongolian route and TransSib – Manchurian route are characterised by the same parameters.

The technical barriers for these routes can be summarised as follows:

- Different gauges in the countries relevant for RETRACK: Europe, China – 1,435 mm; CIS, Mongolia -1,520 mm;
- Different electrical systems on the separate segments: Germany and Austria/ AC 15 KW7/16 2/3 Hz; Eastern Central Europe: AC 25 kV/50Hz; Russia: AC 25kV/50 Hz and DC 3kV
- Different signalling/ control systems: Europe: ERTMS/ETCS, PZB, EVM; Russia: Train control system KLUB, ITARUS-ATC
- Different train length maximums allowed: in EU Europe – about 650 - 750 m; in Russia, China – about 800m -1,000 m
- Weather conditions in Russia, Kazakhstan: the lowest temperature in winter reaches 60°C below zero.

The container transport on the TransSib – Manchurian route benefits the best infrastructure and rolling stock condition, in comparison to the two other routes. It is also better equipped with terminals. The TransSib – Kazakh route is the next best option. Even though infrastructure and rolling stock conditions in Kazakhstan do not yet correspond to international railway transport standards, the Kazakh Government is implementing important railway infrastructure improvement programmes and a number of the projects will directly improve the performance of the TransSib – Kazakh route. The TransSib – Mongolian route remains an inadequate route in regards to the above described options, due to the poor condition of the infrastructure and rolling stock within the Mongolian territory.

9.1.2 Comparison of the operational characteristics

Five main supply chain indicators, where available, were described for the three routes: shipment compatibility, lead time and lead time variability, price, frequency of service and damages and theft. Due to historic reasons the railway standards between all of the countries involved are fully interoperable and therefore, intermodal transport is possible on all of the studied routes.

Table 95: Operational characteristics of the RETRACK – China northern connection

Sections of the route	Lead time block train	Lead time single wagon load train	Border crossings
TransSib – Kazakh route			
Duisburg - Moscow	5	6	3
Moscow – Dostyk	8	12	1
Dostyk – Lanzhou	5	11	1
Total Duisburg - Lanzhou	**18**	**29**	**5**
TransSib – Mongolian route			
Duisburg - Moscow	5	6	3
Moscow – Zamyn Uud	10	20	1
Zamyn Uud – Lanzhou	7	12	1
Total Duisburg - Lanzhou	**22**	**38**	**5**
TransSib – Manchurian route			
Duisburg - Moscow	5	6	3
Moscow – Zabaykalsk	7	12	-
Zabaykalsk – Lanzhou	10	12	1
Total Duisbrug – Lanzhou	**22**	**30**	**4**

There is a high lead time variability for all three routes. Public authorities and private operators can not guarantee the overall transit time which consists of transport time, container handling and processing time, customs clearance and border control operation times. Additionally, on these routes the regular changes of locomotives and crews needs to take place, which is also time consuming.

Insufficient capacity of the Dostyk/Alashankou border crossing station and the unpredictable processing time for the container trains (can vary from 3 to 72 h) is one of the main weaknesses of the TransSib – Kazakh route. In this respect, even if considerably longer, currently, the TransSib – Manchurian route is highly competitive with the shortest TransSib – Kazakh route for the delivery to Lanzhou. As a multiple container train run shows, on average the Duisburg – Beijing transit time for the container train following the TransSib – Manchurian route is 16 days and it is estimated that Beijing – Lanzhou is around an additional 6 days. This service is well regulated and from an organisational and operational point of view it represents less bottlenecks. Therefore, nowadays the TranSib – Manchurian route is the most commonly used land bridge between Europe and China, even for the inner China destinations. When all the foreseen infrastructure improvements of the Dostyk / Alashankou border crossing and the railway lines connected to it take place, the TransSib – Kazakh route will be the most optimal option for the Northern RETRACK connection with Western China.

All three routes have a high potential for the introduction of a new train service (or "frequency of service" as referred in the deliverable). For all three TransSib routes, it highly depends on the available capacity of the main line. As reported by CCTT, there is enough capacity available on the TransSib for the international container traffic. Furthermore, the current capacity of the TransSib – Mongolian route is limited by the railway infrastructure condition. Border crossing stations also influence the overall route capacities.

There are several border crossings involved along each of the routes. The TransSib – Manchurian route has the least amount of border crossings. Due to the creation of the Customs Union of the Russian Federation, Kazakhstan and Belarus, the TransSib – Kazakh route has advantages the TransSib – Mongolian route. Currently, only border control procedures and locomotive changes take place at the borders of the participating Union countries.

The major risks which transport operators encounter while using the TransSib corridor and these three routes are:

- risk of unfair competition on the TransSib corridor;
- risk of non-availability of platform wagons for the container transport
- risk of delays at border crossing stations
- risk of not being punctual
- risk related to different administrative rules and documentation requirements
- risk of non-competitiveness and tariff fluctuations or sudden tariff adjustments

The main operational barriers on the three routes are: availability and disposition of wagons and containers and the flow of information between the countries involved in the corridor.

In regards to the economic potential of the routes, the modelling exercises have shown that in 2010, the TransSib-Manchurian route and TransSib-Kazkh route were the most attractive options in connecting Europe to China. In 2020 the TransSib – Manchurian route will remain the most attractive option for the Eastern coast of China.

From the above mentioned, it can be concluded that currently, the TransSib - Manchurian route is the main railway route which is used by the transport operators for the container transport from Europe to China, even for the inner China regions. It will remain an important land bridge in the future, especially for the railway connections with Eastern China. If the planned infrastructure and operational improvements of the TransSib – Kazakh route take place, in the medium and long term, then this route will provide the most efficient railway connection to Lanzhou.

9.2 Connection of the South of RETRACK with China

There are multiple possibilities to connect the Southern part of RETRACK with China. On the TransSib corridor, the Trans-Kazkh route is the shortest. The interconnection Bratislava – Moscow is the shortest in terms of distance and time, therefore it is chosen for the current comparison.

The assessment of the TRACECA routes have shown that currently the TRACECA – Turkmenbashi route is more attractive for users than the TRACECA Aktau route. The interconnection Bucharest – Varna - Poti between RETRACK and TRACECA offers the shortest delivery time and less bottlenecks.

The Central corridor was also assessed and Bratislava – Aksaralskaya II was chosen for the comparison, as it is shortest in terms of distance and transit time.

9.2.1 Comparison of the technical characteristics and barriers

The technical characteristics of the infrastructure on the individual routes is very different. In comparison to other routes, the TransSib – Kazakh route has the available infrastructure with the majority being double track and almost 60% being electrified. The TRACECA – Turkmenbashi route, even though being the same length as the TransSib – Kazakh route, only about 40% is double track and even less sections are electrified[149]. Moreover, the availability and the rolling stock condition in the countries along TRACECA – Turkmenbashi are the poorest. The route involves Central Asian countries, where the rolling stock was not modernised since the Soviet era and the condition of the infrastructure considerably limits the speed of freight trains. All of the routes share the same railway pass through China on the Dostyk – Lanzhou section.

Table 96 provides a summary of the infrastructure conditions along the three studied routes.

The Russian section of the railways is the main bottleneck of the Central corridor. It is mostly single track and not electrified. On the TRACECA – Turkmenbashi route, the railway infrastructure of the Central Asian countries is the main bottleneck (the entire Turkmenbashi and the majority of the Kazakh sections are single track and not electrified).

On the TransSib- Kazakh route, the maximum train length is 1,000m and the maximum train mass is 2,800 T. The maximum axel load on the Russian sections is 25 T and 23 T on the Kazakh sections and the loading gauge of the entire route is T and 1-T on the Russian, Kazakh and Central Asian sections and 4,800 mm in China. The Central corridor and TRACECA – Turkmenbashi are characterised by comparable parameters, with the majority of the route sections having a maximum axel load of 23 T (the majority of Central Asian countries and Kazakhstan).

[149] 1,455 km of the TRACECA – Trukmenbashi route are Black and Caspian Seas crossings, therefore, track condition and electrification are not applied to them.

Table 96: Technical characteristics of the RETRACK – China southern connection

Sections of the route	Distance, km	Double track, km	Electrified, km*
TransSib – Kazakh route			
Bratislava - Moscow	2,261	2,255	2,264 with 3kV DC and 25kV AC 50Hz
Moscow – Dostyk	4,353	3,514	3,514 with 3kV DC and 25kV AC 50Hz
Dostyk – Lanzhou	2,402,3	1,676	295 with 25kV AC 50Hz
Total Bratislava - Lanzhou	**9,016,3**	**7,445**	**6,073**
Central corridor			
Bratislava – Aksaralskaya II	3,163,4	2,495,4	2,329 with 3kV DC and 25kV AC 50Hz
Aksaralskaya II - Dostyk	3,930,8	1,228	790,4 3kV DC and 25kV AC 50Hz
Dostyk – Lanzhou	2,401,3	1,676	295 with 25kV50Hz
Total Total Bratislava - Lanzhou	**9,496,5**	**5,399,4**	**3,414,8**
TRACECA – Turkmenbashi route			
Bucharest - Poti[150]	1,809,9	127,1	548,9 with 25kV AC 50Hz
Poti – Dostyk [151]	4,759,7	2,036,8	2,088 with 3kV DC and 25kV AC 50Hz
Dostyk – Lanzhou	2,402,3	1,676	295 with 25kV AC 50Hz
Total Bucharest – Lanzhou	**8,971,9**	**3,839,9**	**2,932,1**

** This section gives and approximate amount of electrified lines, which was available from the literature review.*

The technical barriers for all of these routes can be summarised as follows:

- Different gauges in the countries relevant for RETRACK: Europe, China – 1,435 mm; CIS - 1,520 mm;
- Different electrical systems on the separate segments: Eastern and Central Europe: AC 25 kV/50Hz; Russia and Central Asian countries: AC 25kV/50 Hz and DC 3kV;
- Different signalling/ control systems: Europe: ERTMS/ETCS, PZB, EVM; Russia: Train control system KLUB, ITARUS-ATC
- Different train length maximums allowed: in EU Europe – about 650 - 750 m; in Russia and China – about 800m -1,000 m

In terms of distance, the TransSib – Kazakh and TRACECA – Trukmenbashi routes provide the shortest connection of the Southern section of RETRACK with Lanzhou. However, because of the poor infrastructure and rolling stock condition on the TRACECA

[150] 1,185 km are the Black Sea crossing. Therefore, the entire Bucharest - Varna section is double track and electrified.

[151] 270 km are the Caspian Sea crossing.

– Turkmenbashi route, the Central corridor appears to be the second best option for the Europe – China connection.

9.2.2 Comparison of the operational characteristics

Intermodal transport can be organised on all of the studied routes, as they share the same operating standards, both for infrastructure and rolling stock. Furthermore, the operational characteristics of the routes differ greatly. These characteristics are summarised in Table 97.

Table 97: Operational characteristics of the RETRACK – China southern connection

Sections of the route	Lead time block train	Lead time single wagon load train	Border crossings
TransSib – Kazakh route			
Bratislava - Moscow	3,5	8	3
Moscow – Dostyk	8	12	1
Dostyk – Lanzhou	5	11	1
Total Duisburg - Lanzhou	**16,5**	**32**	**5**
Central corridor			
Bratislava – Aksaralskaya II	7,5	10	2
Aksaralskaya II - Dostyk	12	15	1
Dostyk – Lanzhou	5	11	1
Total Total Bratislava - Lanzhou	**24,5**	**36**	**4**
TRACECA – Turkmenbashi route			
Bucharest - Poti	2	5	2
Poti – Dostyk	21	24	4
Dostyk – Lanzhou	5	11	1
Total Bucharest – Lanzhou	**28**	**40**	**7**

The average transit time differs greatly on the routes and currently, the connection of Southern RETRACK with Lanzhou is the most efficient through the TransSib – Kazakh route. On the Central corridor there are less borders to cross (which is an important factor for the transit time variability and the reliability of the route) however, it is not the most efficient option in terms of time. Factors which impact the travel time on the Central corridor are the obsolete railway infrastructure, which considerably reduces freight train travel speeds and container transport is intermingled with general railway traffic which increase travelling time In addition, there is a frequent necessity to change locomotives and crews. The reliability of the transit time is also one of the weakest points of the TRACECA – Turkmenbashi corridor.

From the “free capacity” point of view, the new service can be introduced on all of the routes. The price estimations however, are not available for these routes, as there are no container block trains functioning on the Central corridor (as described in this deliverable) at present and transport agents are not able to provide the price estimation for the entire TRACECA route.

The risk that transport operators encounter on all of the routes are:

- risk of non-availability of platform wagons for the container transport
- risk of delays at border crossing stations
- risk of not being punctual
- risk related to different administrative rules and documentation requirements
- risk of non-competitiveness and tariff fluctuations or sudden tariff adjustments

In addition, on the TransSib – Kazkah route, there is a high risk of unfair competition. The TRACECA – Turkenbashi route has been reported to not always be safe, with unclear and often changed administrative procedures and little or no information available regarding the cargo and presence of illegal payments.

The main operational barriers on the three routes are the availability, disposition of wagons and containers and border crossings along the routes. In addition, the necessity to cross the Black and Caspian Seas and operational problems related to this, represent one of the biggest bottlenecks for the TRACECA – Turkmenbashi route.

The economic forecast reveals that in 2010 and 2020, the TransSib-Kazkh route will remain the most attractive option in connecting Europe to China and that the Central corridor has a high potential for the Southern Europe – China connection as well.

In regards to the Central corridor, this route provides the most direct connections between Europe and China and involves less countries, less border crossings and transshipment points. The forecast of the trade flows along this corridor also indicates a future high potential of the route. The customs union between Kazakhstan and Russia contribute to the attractiveness of the corridor and at the same time, several conditions need to be met for the Central corridor to function as a land bridge between Europe and China. First of all, if fully operational, the Central corridor will attract additional flows from the TransSib-Manchurian and/or TransSib-Kazakh routes, which is not in the best interest of Russia, as Russia is a strong player on the Eurasian railway transport market. For example, at present, the Russian section of the corridor is the weakest in terms of infrastructure. Therefore, a consensus should be met and international cooperation should be established for the future development of this corridor. Secondly, the infrastructure condition of the corridor needs to be considerably improved. If all the ongoing and planned infrastructure rehabilitation and modernisation projects in Kazakhstan are carried out and the Russian section of the corridor is improved, then the corridor will provide the shortest connection between Europe and China.

9.3 Summary

The comparison of the routes assessed in this deliverable shows that nowadays the Northern and Southern parts of RETRACK are most efficiently connected to China via the TransSib rail land bridge. Table 98 summarises the technical and operational characteristics of these routes.

Table 98: Northern RETRACK connection with Western China

Parameter	TransSib – Manchurian route (Duisburg – Lanzhou)	TransSib – Kazakh route (Duisburg – Lanzhou)
Distance, km	13,056	9,117,3
Double track, km	11,460,4	7,553
Electrified, km	10,201,2	6,172
Electrification systems	3kV, 25kV50HZ	3kV, 25kV50HZ
Gauge (mm)	1,520; 1,435	1,520; 1,435
Maximal axel load on the railway section (T)	25	23-25
Max train length (m)	650; 750; 1,000	650; 750; 1,000
Max train mass (T)	2,800	2,800
Loading gauge	0SM, 1SM, 2SM, T, 1-T	0SM, 1SM, 2SM, T, 1-T

Despite the fact the TransSib – Manchurian route is significantly longer, today this is the most efficient route for the cargo delivery from Europe to the inner Chinese regions. The average delivery time Duisburg – Lanzhou by the block train can be estimated at 18 days. Moreover, this is the preferred route for Russia, which, in the case of all TransSib routes is the most important player. The TransSib – Kazakh route seems to be a very attractive option in terms of infrastructure and distance. In the meantime, because of the high risk of unfair competition due to the presence of the monopolistic structures operating on the main TransSib railway market, this route is now underused. In addition, the infrastructure condition on the Kazakh section of the route and the capacity bottleneck at the Dostyk – Alashankou border crossing section, contribute to the fact that this route currently is not being used to its full potential.

The Southern RETRACK is currently the best connected with China through the TransSib – Kazakh route. In practice, some other options through Moscow in Russia and the Ozinki/Iletsk stations in Kazakhstan are also available, however those routes were out of the scope of this deliverable.

Table 99: Southern RETRACK connection with Western China

Parameter	Central corridor (Bratislava – Lanzhou)	TransSib – Kazakh route (Bratislava – Lanzhou)
Distance, km	9,489,1	9,015,3
Double track, km	5,407	7,447
Electrified, km	3420,4	6,070
Electrification systems	3kV, 25kV50HZ	3kV, 25kV50HZ
Gauge (mm)	1,520; 1,435	1,520; 1,435
Maximal axel load on the railway section (T)	23- 25	23-25
Max train length (m)	650; 750; 1,000	650; 750; 1,000
Max train mass (T)	2,800	2,800
Loading gauge	T, 1-T	T, 1-T

In the future, the Central corridor might play an important role in the provision of the railway freight traffic between Southern Europe and China. This is dependent on if its development will receive sufficient political support and if it will be translated into concrete infrastructure modernisation projects and measures on the removal of the operational barriers.

The TRACECA routes are currently not very competitive and in order to compete with the existing options in the future the corridor needs to extensively be improved.

10 Conclusions

Deliverable 13.2 has focused on the assessment of the railway corridors connecting RETRACK and Western China.

In chapter 2 the literature review of the main existing and ongoing railway and intermodal research projects and pilot train runs was made. Expected increases in trade between Eastern Asia and Europe, together with an overloaded and time-consuming (though very reliable) maritime transport, mean a great opportunity to increase trade volumes on land corridors and in particular on railways, since this mode is the most appropriate for long-haul distances in terms of time, cost and environmental friendliness. However, as long as the rail transport does not overcome the main obstacles it faces, which are numerous in the region, it will not be possible to take advantage of its full potential and capacity. There exist multiple ongoing and planned infrastructure modernisation projects, as well as projects which aim to overcome operational barriers of the railway transport in the region.

In Chapter 3 the overview of the RETRACK – China connections was made and the main corridors and routes were chosen for the assessment. These corridors are the Trans-Siberian corridor, which is further detailed by the TransSib – Kazkah, TransSib – Mongolian and the TransSib – Manchurian routes; the Central corridor and the TRACECA railway corridor, composed of the TRACECA – Turkmenbashi and the TRACECA – Aktau routes. For all of the corridors the main interconnections with RETRACK were assessed. For the connection with Northern Europe, Duisburg – Moscow is perceived as the most efficient and already functioning connection. Bratislava, Bucharest and Budapest were identified as the connection points of the Southern part of RETRACK with its respective corridors. Lanzhou was identified as the final corridor destination in Western China.

Chapter 4 focused on the description of the railway infrastructure and rolling stock condition and institutional framework in the countries involved in the selected corridors. The countries dispose a solid railway network which provides possibilities of connecting the EU and China by rail. At the same time, the condition of the infrastructure in the majority of the countries is poor and is characterised by the high level of deterioration. Central Asian countries and Russia are making the first steps towards railway sector reforms. All of the countries are actively involved in different international and bilateral agreements which provide a legal basis, as well as an operational framework for the cooperation in the region.

The following chapters 5, 6 and 7 have provided a detailed assessment of the infrastructure and operational conditions on the concrete routes of the TransSib, Central and TRACECA corridors respectively. The TransSib – Manchurian, TransSib – Kazakh and the Central corridor route and TRACECA – Turkmenbashi route were identified as having a high potential for the RETRACK – China connection.

In chapter 8 the opportunities for the rail land bridges between China and the EU were further detailed for the four pre-selected routes. A model-based analysis of the 4 rail corridors was conducted in order to assess the current (2010) and future (2020) attractiveness of these corridors for the delivery of cargo by rail from Europe to China. Rail corridors were further compared with the maritime transport solution. The results have shown, that in 2010 the TransSib-Manchurian and TransSib-Kazakh routes were the most attractive options to connect Europe with Western China, with the TranSib-Kazakh route being even slightly more attractive. The TRACECA and Central corridors are not a viable option. In 2020, both routes will remain the most attractive rail land bridge options. The most important expectation for 2020 is that the Central corridor will improve its performance and also become a good transport option, not being far behind the leading corridors.

Chapter 9 provides the comparison of the routes. The comparison is divided into two parts: comparison of the connection of the Northern and Southern parts of RETRACK with Western China. For the Northern part, the TranSib-Manchurian route is currently used the most, even for the inner China railway transport. If the infrastructure modernisation projects will be successfully implemented in Kazakhstan, then the TransSib – Kazakh route will be by far more attractive and a competitive option for this connection.

In regards to the Southern RETRACK connection with China, nowadays, the TransSib – Kazakh route is the most efficient option. If political consensus is agreed upon and if the corridor initiative is supported, then the Central corridor can become one of the most attractive options for the connection of Southern Europe with Western China.

With regards to the TRACECA corridor, considerable improvements in infrastructure, rolling stock, as well as on the operational issues need to be done in order for this corridor to be able to compete in a long term with other above described corridors.

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ANNEX 1. Overview of R&D initiatives and its member countries

	TRACECA	NELTI	East - Wind	Trans Eurasia	SPECA	CAREC
Afghanistan					x	x
Azerbaijan	x	x	x		x	x
Armenia	x					
Belarus		x		x		
Belgium			x			
Bulgaria	x					
China		x		x		x
Georgia	x	x				
Germany		x	x	x		
Iran	x	x				
Kazakhstan	x	x	x	x	x	x
Kyrgyzstan	x	x			x	x
Moldova	x					
Mongolia			x	x		x
Netherlands			x			
Pakistan						x
Poland		x				
Romania	x					
Russia		x	x	x		
Tajikistan	x				x	x
Turkey	x	x				
Turkmenistan		x			x	x
Ukraine	x					
Uzbekistan	x	x	x		x	x

ANNEX 2. Comparison of speed on CAREC rail and road corridors

	Rail		Road	
Corridor	SWOD	SWD	SWOD	SWD
1a	34.5	18.9	18.2	9.0
1b	34.7	20.7	39.3	17.8
2b	9.0	9.0	40.5	19.3
3	25.1	17.8	54.2	13.0
4	15.5	6.8	41.4	12.5
6a	23.3	10.0	59.5	21.3
6b	49.7	25.5	40.5	12.4

Source: CAREC CPMM 2010 Annual Report.

ANNEX 3. LPI Assessments

Table 100: LPI Domestic (qualitative assessments)

	AZE	BEL	BU	DE	HU	KAZ	MON	POL	PRC	RO	RF	SER	SK	TUR	TKM	UKR	UZB
Level of fees and charges at/in/of… (Percent of respondents answering high/very high)																	
Ports	50,0	0,0	33,3	20,0	100,0	15,4	100,0	14,3	38,1	100,0	36,4	33,3	0,0	90,9	0,0	40,0	45,0
Airports	50,0	100,0	0,0	75,0	0,0	55,4	100,0	28,6	23,8	66,7	33,3	100,0	0,0	70,0	0,0	40,0	60,5
Road transport	50,0	100,0	25,0	20,0	100,0	51,6	0,0	7,1	23,8	33,3	50,0	33,3	0,0	54,6	0,0	20,0	36,6
Rail transport	50,0	100,0	0,0	25,0	100,0	26,3	100,0	30,8	16,7	33,3	10,0	33,3	100,0	10,0	0,0	20,0	22,5
Warehousing/transloading	50,0	100,0	0,0	20,0	0,0	30,3	100,0	21,4	20,0	0,0	44,4	0,0	0,0	45,5	-	20,0	35,0
Agents	50,0	100,0	25,0	25,0	0,0	14,6	100,0	14,3	33,3	0,0	30,0	0,0	0,0	27,3	0,0	40,0	56,1
Quality of infrastructure at/in/of…(Percent of respondents answering low/very low)																	
Ports	100,0	100,0	50,0	0,0	100,0	71,0	0,0	14,3	0,0	33,3	18,2	100,0	100,0	18,2	100,0	40,0	71,4
Airports	0,0	100,0	75,0	0,0	0,0	29,7	0,0	21,.4	4,8	33,3	33,3	66,7	50,0	0,0	100,0	40,0	21,4
Roads	100,0	100,0	75,0	0,0	0,0	45,1	0,0	71,4	31,8	66,7	20,0	33,3	0,0	18,2	100,0	40,0	51,3
Rail	100,0	0,0	75,0	0,0	100,0	26,9	0,0	64,3	55,0	66,7	0,0	100,0	50,0	63,6	-	20,0	21,1
Warehousing/transloading	100,0	100,0	25,0	0,0	0,0	11,1	100,0	14,3	33,3	0,0	30,0	33,3	0,0	0,0	-	0,0	59,0
Telecommunication & IT	100,0	100,0	0,0	0,0	0,0	3,3	100,0	0,0	31,8	0,0	55,6	33,3	0,0	9,1	100,0	20,0	12,2
Competence of quality and services at/in/of…(Percent of respondents answering high/very high)																	
Road	0,0	0,0	50,0	100,0	0,0	57,1	0,0	84,6	19,1	0,0	10,0	66,7	0,0	63,6	0,0	16,7	23,8
Rail	0,0	0,0	0,0	80,0	0,0	48,0	0,0	23,1	14,3	0,0	10,0	0,0	0,0	27,3	0,0	16,7	21,1
Air transport	0,0	0,0	50,0	83,3	100,0	34,1	100,0	58,3	42,9	0,0	22,2	0,0	50,0	81,8	0,0	50,0	19,2
Maritime transport	0,0	0,0	100,0	83,3	100,0	2,0	0,0	84,6	52,4	50,0	18,2	100,0	0,0	63,6	0,0	33,3	12,5
Warehousing/transloading & distribution	0,0	0,0	25,0	83,3	0,0	14,3	0,0	69,2	19,1	50,0	10,0	33,3	100,0	63,6	-	50,0	14,3
Freight forwarders	0,0	100,0	50,0	83,3	100,0	37,9	100,0	76,9	47,6	50,0	27,3	66,7	100,0	63,6	0,0	50,0	15,0
Customs agencies	0,0	0,0	75,0	75,0	0,0	7,6	0,0	53,9	23,5	33,3	27,3	0,0	0,0	36,4	0,0	50,0	0,0
Inspection agencies	0,0	0,0	75,0	80,0	0,0	7,7	100,0	16,7	14,3	0,0	0,0	0,0	50,0	40,0	0,0	33,3	2,4
Health/SPS agencies	0,0	0,0	0,0	100,0	0,0	9,8	0,0	25,0	14,3	0,0	12,5	0,0	0,0	37,5	0,0	33,3	2,5
Customs brokers	0,0	0,0	75,0	80,0	0,0	9,7	100,0	23,1	9,5	0,0	27,3	0,0	0,0	45,5	0,0	33,3	7,1
Trade & Transport Assoc.	0,0	0,0	0,0	80,0	0,0	29,7	100,0	15,4	9,5	0,0	20,0	0,0	0,0	22,2	0,0	16,7	11,9

Consignees & shippers	0,0	100,0	0,0	83,3	0,0	32,6	100,0	23,1	9,5	0,0	0,0	0,0	0,0	9,1	0,0	16,7	7,1
Efficiency of processes (Percent of respondents answering often or nearly always)																	
Clearance & delivery of imports	0,0	0,0	100,0	83,3	0,0	63,6	100,0	92,3	57,1	100,0	27,3	33,3	100,0	63,6	100,0	83,3	18,0
Clearance & delivery of exports	0,0	0,0	100,0	83,3	100,0	50,6	100,0	92,3	76,2	66,7	70,0	100,0	100,0	90,9	100,0	83,3	36,6
Transparency of customs clearance	0,0	0,0	50,0	100,0	0,0	22,3	100,0	61,5	35,3	33,3	0,0	33,3	100,0	45,5	0,0	50,0	31,7
Provision of adequate and timely information on regulatory changes	0,0	0,0	0,0	80,0	100,0	53,2	0,0	38,5	28,6	0,0	27,3	66,7	100,0	54,6	100,0	50,0	7,5
Expedited custom clearance for traders with high compliance levels	0,0	0,0	25,0	75,0	0,0	18,1	100,0	50,0	29,4	50,0	9,1	33,3	100,0	18,2	100,0	33,3	48,8
Sources of mayor delays (Percent of respondents answering often or nearly always)																	
Compulsory warehousing/transloading	50,0	0,0	25,0	25,0	100,0	10,0	0,0	7,7	0,0	33,3	50,0	0,0	0,0	0,0	-	16,7	53,7
Pre-shipment inspection	100,0	0,0	0,0	25,0	100,0	30,0	0,0	0,0	5,3	66,7	50,0	33,3	0,0	20,0	0,0	0,0	59,5
Maritime transhipment	100,0	0,0	50,0	0,0	0,0	13,2	0,0	15,4	5,3	33,3	45,5	0,0	0,0	0,0	0,0	0,0	33,3
Criminal activities	50,0	0,0	0,0	0,0	0,0	6,6	0,0	0,0	0,0	0,0	10,0	0,0	0,0	0,0	0,0	33,3	19,4
Informal payments	100,0	0,0	0,0	33,3	0,0	24,4	100,0	0,0	6,7	0,0	72,7	0,0	0,0	0,0	100,0	33,3	46,2
Changes in the logistics environment since 2005 (Percent of respondents answering improved or much improved)																	
Customs clearance procedures	0,0	100,0	75,0	50,0	0,0	56,7	100,0	92,3	68,4	100,0	18,2	100,0	50,0	70,0	100,0	50,0	11,9
Other official clearance procedures	0,0	100,0	50,0	25,0	0,0	18,3	0,0	76,9	52,6	33,3	10,0	66,7	100,0	40,0	100,0	33,3	15,4
Trade & transport infrastructure	0,0	100,0	50,0	50,0	0,0	58,8	0,0	76,9	84,2	50,0	27,3	66,7	100,0	70,0	-	66,7	35,9
Telecommunications & IT infrastructure	50,0	100,0	75,0	75,0	-	78,4	100,0	92,3	79,0	100,0	66,7	33,3	100,0	90,0	0,0	66,7	76,2

Private logistics services	0,0	100,0	100,0	50,0	100,0	83,2	100,0	92,3	83,3	100,0	60,0	100,0	100,0	80,0	-	66,7	23,8
Logistics regulation	0,0	0,0	0,0	33,3	0,0	74,7	0,0	53,9	68,4	50,0	55,6	0,0	0,0	44,4	0,0	16,7	12,2
Incidence of corruption	0,0	0,0	75,0	50,0	0,0	18,0	0,0	76,9	33,3	50,0	18,2	33,3	0,0	50,0	0,0	0,0	12,5

Source: www.worldbank.org

Table 101: LPI Domestic (quantitative assessments)

	AZE	BEL	BU	DE	HU	KAZ	MON	POL	PRC	RO	RF	SER	SK	TUR	TKM	UKR	UZB
Clearance time with physical inspection (days)	4,00	3,00	1,00	1,57	4,00	1,74	2,00	1,42	3,38	1,59	4,62	1,41	0,50	3,06	3,00	2,52	1,50
Clearance time w/o physical inspection (days)	4,00	1,00	0,59	0,71	2,00	1,62	2,00	0,79	1,70	1,00	2,57	1,00	0,25	1,36	2,00	1,26	2,87
Physical inspection (%)	75,00	35,00	5,15	3,26	2,50	42,31	50,00	4,83	8,59	6,87	44,20	14,79	2,50	15,96	6,25	50,82	49,27
Multiple inspection (%)	75,00	18,00	1,58	5,29	1,00	20,96	50,00	2,54	2,46	1,00	10,05	1,00	1,00	5,75	2,50	7,77	3,83
Lead time export for port/airport, median (days)	7,00	-	2,00	3,63	-	-	14,00	3,04	2,77	2,00	3,98	2,00	3,00	2,19	3,00	1,68	1,41
Lead time import for port/airport, median (days)	3,00	-	3,87	-	5,00	-	12,00	3,55	2,56	2,00	2,88	3,00	5,00	3,83	-	7,00	2,00
No agencies import	2,00	5,00	1,50	2,25	2,00	4,19	8,00	1,44	4,06	2,00	5,83	1,00	1,00	3,11	5,00	5,00	4,12
No. agencies export	2,00	3.00	1,50	2,75	2,00	4,71	5,00	2,56	4,20	1,67	5,17	2,50	1,00	3,44	4,00	6,33	4,14

Typical charge for a 40-foot export container or a semi-trailer (US$)	1,414	-	1,500	612	-	-	-	702	419	2,236	1,310	1,000	1,500	1,626	1,500	1,612	387
Typical charge for a 40-foot import container or a semi-trailer (US$)	4,000	-	250	-	3,000	-	1,000	1,145	376	1,000	1,145	1,500	1,500	785	-	3,000	387

Source: www.worldbank.org

ANNEX 4. Companies on the Russian freight rail market

First Freight Company OJSC (Freight One, FFC) was established in 2007 by transformation of the former RZD's subsidiary. The company is a rail transport operator and specialises in operating and leasing of its rolling stock, provision of transport and shipping services as well as managing the rolling stock of third parties. It owns 195,199 units of car fleet of various types (approximately 53% open wagons, 28% tank cars, 7% box cars, 3% platforms). The company share of all rolling stock in the Russian Federation is 19%.[152] Until October 2011 the Freight One was a 100%-daughter company of RZD (100 %-1 share). In October its controlling stake (75% - 2 share) was sold to the Independent Transportation Company Ltd. (NTK). NTK belongs to the Universal Cargo Logistics Holding B.V. (UCL Holding). With the acquisition of the FFC it will rise to the largest private railway company in the Russian rail freight services market. The own freight car fleet of NTK before buying comprised about 27.000 units (mostly open wagons).

Second Freight Company OJSC (Freight Two) was established in 2010 (share of RZD is 100 % -1 share). Company operates and leases its own rolling stock and provides shipping services. The company owns 180,00 wagons of various types (76% from which are open wagons) and specializes in transporting of ferrous metals, coal, chemical fertilizers and building materials.

TransContainer OJSC was founded in 2006 (share of RZD is 50% + 1 share). The company specialises in intermodal container transportation and integrated logistics solutions. It is the market leader in Russia by container flatcar fleet size (approximately 24,255 flat cars)[153] and transported volumes of TEUs[154]. TransContainer is also owner and operator of own container equipment. The company's own container fleet comprises 58,784 high capacity containers HCC and 55,478 medium capacity containers MCC. Furthermore the company owns a network of rail-side container terminals located at 46 railway stations in Russia and operates one terminal in Slovakia (Dobra) under a long-term lease agreement. Company's share in freight transportation through TSR reached 59% during the first six months 2011.[155]

Russkaya Troika CJSC was founded in 2004 (share of RZD is 25%+ 1 share). The company specialises in freight transportation and forwarding, notably in transportation in container block trains. It provides also the services for organisation of regular traffic between container terminals and logistic centres (Moscow, Novosibirsk, Vladivostok, Slawkow). The company owns a park of 60 and 80-foot container platforms, for transporting of 40 and 20 foot containers.

In 2004, the Far Eastern Shipping Company (FESCO) developed a partnership with RZD to create a Russian Troika Ltd. Company (share of RZD is 25%+ 1 share), which

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[152] Annual Report JSCo Russian Railways 2010; Freight One corporate information.

[153] Ref. 31.12.10, TransContainer

[154] 1,46 millions TEU in 2009.

[155] 1,46 millions TEU in 2009.

specializes in freight transportation and forwarding, notably in transportation in container block trains and owns a park of container platforms.[156]

In 2008 RZD and Deutsche Bahn AG using the networks of the partner companies TransContainer, Polzug and Kombiverkehr and established a joint venture named Trans Eurasia Logistics Ltd. (TEL). TEL is specialising in container transportation between Germany, RF and PRC and is from 2011 a co-provider in partnership with the company IRS InterRail Services Ltd of the transport services for container block train “Ostwind”.[157]

[156] Russia: Opportunities for Russian Far East Railroads, U.S. Commercial Service, 2006

[157] http://www.transeurasialogistics.de/News/Company.php

ANNEX 5. RZD rail directorates along the routes using TransSib corridor

Competent RZD Directorates along the Transsib Corridor

Rail Directorates	Distance (rail-km, Moscow = 0)	Major Railway stations
Moscowskaya Railway	0 - 112	Moscow – Alexandrov-1
Northern Railway	113 - 817	Moshnino - Yaroslavl - Danilov - Buj - Sharja – Swecha
Gorkovskaya Railway	818 – 1223	Yuma – Kotelnich-1 - Kirov - Balesino
Sverdlovskaya Railway	1224 – 2561	Chepza – Perm-2 - Yekaterinburg - Kamyshlow - Tymen - Ishim
West-Sibirskaya	2562 – 3712	Nazyvaevskaya - Omsk - Barabinsk - Novosibirsk - Tayga
Krasnoyarskaya Railway	3713 – 4489	Mariinsk – Achinsk-1 - Krasnoyarsk - Ilanskaya - Novonikolaevskiy
East-Sibirskaya Railway	4490 – 5783	Yurty - Taijshet - Zima – Irkutsk-1 - Slyudanka-1 – Ulan-Ude
Zabaykalskaya Railway	5784 – 8077	Petrovskiy Zavod - Chita-2 - Shilka – Chernyshevsk-Zab. - Mogocha - Skovorodino - Belogorsk – Zhuravli
Far East Railway	8078 – 9289	Archara - Birobidzhan - Habarovsk-1 - Vyazemskaya - Ruzhino - Ussurijsk – Vladivostok

Source: RZD

The allocation of the three routes within the Retrack – Transsib corridor to the competent RZD railway directorates is shown by the below table.

RZD Rail Directorates relevant for Transsib Corridor routes Retrack - PRC

No	Railway	Competent for operations along Transsib Corridor routes
1	Moscowskaya Railway	Route 1,2,3
2	Northern Railway	Route 1,2,3
3	Gorkovskaya Railway	Route 1,2,3
4	Sverdlovskaya Railway	Route 1,2,3
5	West-Sibirskaya	Route 2,3

6	**East-Sibirskaya Railway**	**Route 2,3**
7	**Krasnoyarskaya Railway**	**Route 2,3**
8	**Zabaykalskaya Railway**	**Route 3**
9	Far East Railway	
10	Kaliningradskaya Raylway	
11	Northern Railway	
12	Oktyabrskaya Railway	
13	Kuibyshevskaya Railway	
14	**South-Uralskaya Railway**	**Route 1**
15	South-Eastern Railway	
16	North-Kavkazskaya	
	Total	

Source: RZD web page

Route 1: Moscow – Petropavlovsk – Kazakhstan

Route 2. Moscow – Naushki - Mongolia –PRC

Route 3: Moscow – Zabaykalsk – PRC

ANNEX 6. Interrogated companies and operators along the Transsib corridor

List of interrogated Companies and Operators

Name of the company	Country	Field of activity
1. Belarussian Railways	BY	Infrastructure manager
2. Belintertrans	BY	Rail operator
3. CJSC Russkaya Troyka	RF	Intermodal container rail operator
4. DVTG Group	RF	Rail operator
5. Eurosib	RF	Rail operator, forwarder
6. HUPAC Intermodal SA	CH	Intermodal transport operator
7. InterRail Services GmbH	GER	Rail operator
8. InterRail Trans Siberian Express Service LLC	RF	Rail operator
9. JSC Freight One	RF	Rail operator
10. JSC Transcontainer	RF	Intermodal container transport operator
11. Polzug Intermodal Ltd.	GER	Intermodal container operator
12. Transsystem	KZ	Intermodal freight transport operator
13. Trans Eurasia International Logistics	PRC	Rail operator

Brief Profile of the Companies interrogated regarding the Transsib corridor

Belarussian Railways, Belintertrans – infrastructure manager, rail operator (1 + 2)

Container train operations within and via Belarus:

- Mongolian Vektor: Brest-Ulan Bator (10-12 days), 1-2 trains a month
- Ostwind (1 train per 3 weeks), Peugeot Citroen France-Russia, Viking

- Apart from Brest – Grodno border crossing (Bruzgi), less busy

Length of trains from Poland – 25 wagons, from Belarus to Poland 40 wagons, axle load about 20 tons

CJSC Russkaya Troyka – intermodal container rail operator (3)

The closed joint stock company is affiliated to RZD and carries out 90% of the transport activities within the Russian Federation

- Major route: Moscow (terminal “Ecodor”) -Vladivostok (Nachodka).

  Transport duration: 10 days, 5 times a week, Novosibirsk terminal is on the route

- Moscow-Beijing route – is planned, implementation is under preparation

- Services to and from the European Union via Russia-Ukraine-Poland (Slawkow terminal), or through Lithuania via Kaliningrad

Antwerp – Chongqing service takes 20-25 days. The transit time is planned to be reduced to 15-20 days. The five-days-a-week service is jointly operated by Hupac, Russkaya Troyka and Eurasia Good Transport, runs through Germany and Poland to Ukraine, Russia, Mongolia and China.

DVTG Group (4)

Fields of activities at Transsib:

- Freight transport within the Russian Federation

- Carriage of import/export commodities Russia – PR China and Korea

- No transport to the European Union

Most important terminals used by DVTG Group along the Transsib: Tuchkovo near Moscow, Zabaykalsk (border crossing 3-4 days)

Eurosib – rail operator, forwarder (5)

Eurosib is serving domestic services within the Russian Federation and the customs union of Belarus, Russian Federation and Kazakhstan. As to the Transsib Routes, regular services are operated between

- Moscow-Novosibirsk-Nakhodka (station Silikatnaya near Moscow)

- St. Petersburg (terminal Shushary)-Novosibirsk

Hupac Intermodal Ltd. – Intermodal transport operator (6)

HUPAC is based in Switzerland. The company offers rail container transport services between Schwarzheide (public BASF terminal in Germany) – Warsaw (Poland) – Moscow and from/to Moscow to and froms

- Dostyk (Kazakhstan) – Urumqi (PRC) resp.
- Krasnoyarsk (Ru) – Beijing (Ch)

Services are carried out by collaboration with RZD affiliated companies.

JSC Freight One – rail operator (9)

Freight One is affiliated to RZD, and was the first dedicated rail operations company under non-RZD participation. The main services of the closed joint-stock company along the Transsib Corridor are

- Moscow-Nachodka
- Moscow-Ulanbator (via Mongolia)
- Moscow-Zabaykalsk,

JSC Transcontainer (10)

Transit container trains operated by Transcontainer, a company affiliated to the RZD organisation (RZD Central Direction on Terminal and Warehouse complexes and Russkaya Troyka) by majority, is, among others, active at the following sections of the Transsib corridor and related routes:

- Brest – Naushki (Mongolian Vector)
- Berlin – Krasnoe – Bekassovo -Ozinki – Almaata (Kazakh Veter)
- Kazakhstan – Petropavlovsk – Krasnoe - Klaipeda
- Zabaykalsk – Zernovo – Chop
- Nakhodka - Yekaterinburg
- Moscow – Berlin (Ostwind)
- Vienna – Budapest – Moscow (via Dobra)

<u>Transit and transit time examples:</u>

- Moscow (via Kunzevo 2 station) – Zabaykalsk: 7 days 15 hours for 6534 km
- Nachodka – Brest (10 days 19 hours)

Own border crossing Terminals in Zabaykalsk, Dobra (Slovakia), and international terminal operations in the PRC (Dalian, Beijing, Shenzen, Shanghai, Tianjin)

Polzug Intermodal GmbH (11)

Polzug is a joint venture enterprise of the shareholders DB Mobility Logistics AG, HHLA Intermodal GmbH and PKP Cargo S.A., each party holds 1/3 of the shares, to operate container block trains from continental European North sea ports to Poland and vice very. Polzug offers **c**ross-border rail transport services and **Re-expedition** and transhipment onto broad gauge rail systems via the following stations

1. Malaszewicze/Brest (Polish – Belorussian border)
2. Medyka (Polish – Ukrainian border)
3. Skandawa (Polish – Kaliningrad border)
4. Šeštokai terminal (Polish – Lithuanian border)
5. Polzug Terminal Sławków near Katowice (with broad gauge link)

Polzug offers 6 bloc train departures per week from and to Hamburg, 3 departures from and to Bremerhaven, and four bloc train departures per week from/to Rotterdam and the abive terminals. The service times between Germany and Poland are one day (Posznan) and two (all others) days, and three or four days from/to Rotterdam and Poland. Transit time from and to Malaszewice and the German destinations are indicated by 4-5 days, from and to Rotterdam by 7 days. Times include acceptance and release time of containers. Transit of containers without customs clearance may take one additional days.

8. Transsystem (Kazakhstan) – intermodal freight transport operator (12)

Transsystem operates and manages trade and cargo flow related freight transport within Kazkhstan and Imports and Exports with destination or origin in Kazakhstan. Transsystems' operations are not limited to containers or intermodal units, and comprise large volumes of breakbulk and bulk commodity shipments as well. As regards container transportation, Transsystem is freight agent, and as shipper and transport organisation while rail or other modal operations are carried out by the state railway organisation of e.g. Kazakhstan or the Russian Federation on Transsystem's behalf.

The main routes follow the dense trade relations with the Russian Federation and via Russia to the Baltic and the Far East Ports in cooperation with the Kazakh Railways and with RZD via all four available border crossings Kazakhstan- Russia, and via Dostyk with the PR if China.

Trans Eurasia International Logistics (13)/**InterRail Trans Siberian Express Service LLC (RF)(7)/*****InterRail Services GmbH (Germany)(8)***

Both th organsaitions InterRail Trans Siberian Express Service and Inter Rail Service belong to the Transinvest Group (Mr. Albert) St. Gallen; InterRail operates the Container Train Eastwind as block train from Berlin (Großbeeren) to Brest and then with vector trains to Moscow/Kaluga and to Kazakhstan/Central Asia in cooperation with RZD affiliated organisation Transcontainer.

The group is operator of the container bloc trains “Ostwind” and “Westwind” at the route: Großbeeren – Brest – Moscow (st.Bekassovo). Transport to Kazakhstan and beyond to China via Ozinki is offered for single wagons and wagon groups via Moscow.

- The “Ostwind” (Engl. “Eastwind”) train is a production platform for InterRail (to Kazakhstan) and for TransEurasia (DB, RZD) (to Kaluga). As per 2011, the Eastwind departs 4 times a week from Berlin. The “Westwind” train serves the same relation with the same frequency from East to West.
- Connections with China via Kazakhstan (Dostyk) are established
- Trial runs to further to connect the East Wind with connections all over in China (single or waggon groups) were carried out. The results are under evaluation.

The route via the border station Ozinki is the cheapest route to Kazakhstan an beyond, and hence regularly served.