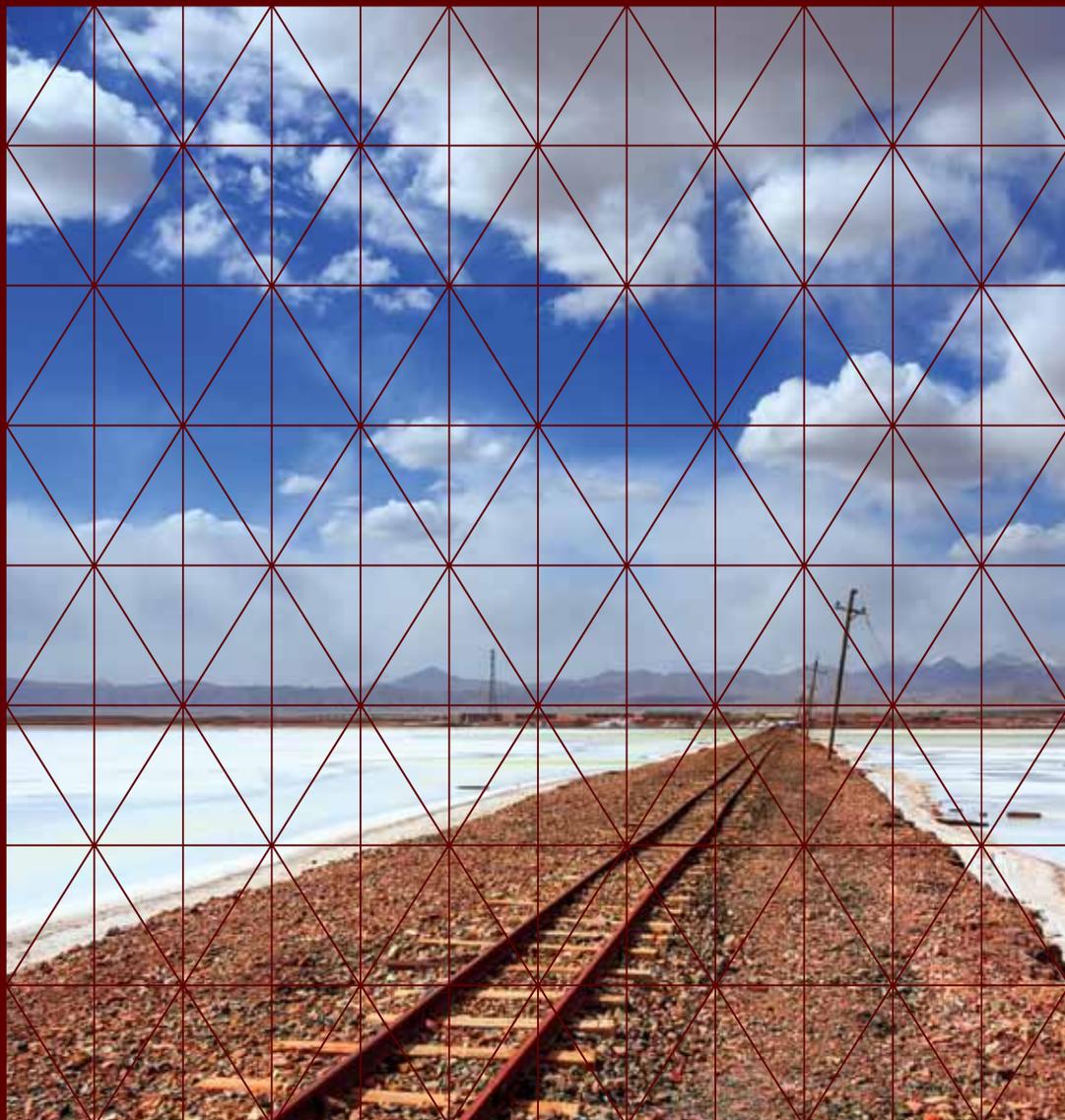


72

OSW STUDIES

OSW



THE SILK RAILROAD

THE EU-CHINA RAIL CONNECTIONS:
BACKGROUND, ACTORS, INTERESTS

Jakub Jakóbowski, Konrad Popławski, Marcin Kaczmarek

THE SILK RAILROAD

THE EU-CHINA RAIL CONNECTIONS: BACKGROUND, ACTORS, INTERESTS

Jakub Jakóbowski, Konrad Popławski, Marcin Kaczmarek



OSW |

CENTRE FOR EASTERN STUDIES

OŚRODEK STUDIÓW WSCHODNICH im. **Marka Karpia**

© Copyright by Ośrodek Studiów Wschodnich
im. Marka Karpia / Centre for Eastern Studies

CONTENT EDITOR

Adam Eberhardt

EDITOR

Halina Kowalczyk

CO-OPERATION

Katarzyna Kazimierska, Anna Łabuszewska

TRANSLATION

Magdalena Klimowicz

CO-OPERATION

Nicholas Furnival

GRAPHIC DESIGN

PARA-BUCH

PHOTOGRAPH ON COVER

Rick Wang, shutterstock.com

DTP

GroupMedia

MAPS AND CHARTS

Wojciech Mańkowski

PUBLISHER

Ośrodek Studiów Wschodnich im. Marka Karpia

Centre for Eastern Studies

ul. Koszykowa 6a, Warsaw, Poland

Phone: + 48 /22/ 525 80 00

Fax: + 48 /22/ 525 80 40

osw.waw.pl

ISBN 978-83-65827-19-7

Contents

THESES /5

I. CHINA'S GOALS IN DEVELOPING RAIL TRANSPORT BETWEEN CHINA AND THE EU /17

1. Chinese provinces as the driving force of cooperation /19
2. China's central government as the new leader of creating connections with Europe /23

II. RAIL CONNECTIONS BETWEEN CHINA AND THE EU: THE PRESENT SHAPE AND THE PROSPECTS /27

1. Main challenges to China-EU rail transport /29
2. Carriage organisation and handling – the need for international cooperation /31

III. THE DEVELOPMENT OF CHINA-EU RAIL TRANSPORT CORRIDORS /34

1. The trans-Siberian corridors (via Russia) /38
 - 1.1. Utilisation to date /40
 - 1.2. Hard infrastructure /41
 - 1.3. Soft infrastructure /42
 - 1.4. Stakeholders /43
 - 1.5. The political context /45
2. The trans-Caspian corridors /48
 - 2.1. Utilisation to date /50
 - 2.2. Hard infrastructure /50
 - 2.3. Soft infrastructure /51
 - 2.4. Stakeholders /51
 - 2.5. The political context /52
3. The southern corridors via Turkey /54
 - 3.1. Utilisation so far /56
 - 3.2. Hard infrastructure /56
 - 3.3. Soft infrastructure /57
 - 3.4. Stakeholders /57
 - 3.5. The political context /58
4. A separate sea-land route – the Balkan corridors /60
 - 4.1. Utilisation to date /62

- 4.2. Hard infrastructure /63**
- 4.3. Soft infrastructure /64**
- 4.4. Stakeholders /64**
- 4.5. The political context /65**

IV. THE ECONOMIC POTENTIAL OF THE CHINA-EU RAIL CONNECTION /67

- 1. Trade exchange – the strengths and weaknesses of rail transport /68**
- 2. Transport of goods by rail – an added value for EU member states /76**
- 3. Location of logistics centres and distribution of added value within the EU /85**
- 4. The trade balance /90**

V. MODELS OF BUSINESS COOPERATION WITH CHINA BASED ON RAIL CONNECTIONS /93

- 1. Direct connections between factories operated by global companies /93**
- 2. High value goods /96**
- 3. Products with a short life cycle /97**
- 4. Mail/e-commerce /98**
- 5. The export of foodstuffs /100**

THESES

The role of rail transport in EU-China trade relations

- EU-China rail transports have experienced a hundredfold increase since the beginning of the 2010s. From 2011, when the first regular connections were introduced, 6,637 freight trains were launched in both directions, including 3,673 in the record-breaking 2017 alone. The value of goods shipped by rail in 2016 can be estimated at US\$ 22.9 billion, which constituted about 4% of overall EU-China trade. The estimated value of goods transported by train in 2020 may reach US\$ 76.5 billion. More than two thirds of trains are run from China to Europe, reflecting the Chinese general trade surplus with the EU.
- Most forecasts assume that rail transport can only cover several per cent of the total volume of goods transported from Asia to Europe and *vice versa*. In 2017 about 200,000 TEU (twenty-foot container equivalent) were shipped by train from China to Europe, while maritime container flow reached 10 million TEU. For example, rail is not a suitable means of transporting raw materials and unprocessed metals, as well as most industrial products. It is much more favourable to use rail to transport mainly high-value goods and capital-intensive goods. As a consequence, when it comes to the share of goods transported by train in the total transport of goods between China and the EU, the market share expressed in values exceeds the market share expressed in volumes. A rail connection may enable China to gain a competitive advantage in logistics over its Asian competitors. It is also an opportunity for Europe to strengthen its position in China, in particular in the luxury goods and premium food market segments.
- The biggest advantage of rail transport is the fact that it is a form of transporting goods in the middle of the scale between cheap and slow maritime transport and fast and expensive air freight. The time it takes to transport goods from one terminal to another by air is 5-9 days, by rail 15-19 days and by sea 37-50 days. Compared with maritime transport, rail transport is particularly attractive for places located far from sea ports. In many branches of commerce, the speed of market changes is so fast that companies are ready to pay higher rates for transportation than what they usually pay for sea freight just to gain some time. Rail transport may also prove attractive for goods that have so far been dispatched by air, provided that the slightly longer delivery time is acceptable.

- It is cost-effective to use rail transport for high value goods. The maritime transport of high value goods entails the need to freeze capital for several weeks and generates high costs for companies, in particular those which use external funding. Another example of rail freight is the transport of goods which need to be delivered quickly. Rail transport can also be used to dispatch goods such as electronic devices for which air transport always seemed too expensive but was the only available option. In the case of these goods a slightly longer delivery time (by several days) is acceptable. Moreover, the more frequent use of rail transport will generate new trade flows to transport fresh food which needs to be delivered relatively quickly and the transport cost of which cannot be excessively high due to average-level profit margins.

China's role and motivation in developing the rail connections

- The development of rail connections between China and Europe has become one of the key elements of the New Silk Road initiative announced by China's President Xi Jinping in 2013. The development of transport corridors is a component of Beijing's long-term strategy that promotes trade with Central Asia and the EU and stimulates economic development in China's inner provinces. It also aims to increase the role of Chinese companies in EU-China trade as a whole along the entire value chain (forwarding, transport, logistics infrastructure) and to facilitate China's economic expansion in these countries. There are plans to build industrial parks along rail routes to attract Chinese investors. This is expected to translate into increased trade, more frequent interpersonal contacts and boosted tourism. Moreover, Beijing began to use rail connections with Europe as a diplomatic tool.
- The local governments of Chinese provinces and cities have become key actors in the development of rail connections between China and the EU. There are both political and economic reasons behind the provinces' involvement in building rail connections. By filling out the vision presented by Xi Jinping with genuine content and by manifesting active support for Beijing's plans, local government officials are trying to win political support from the central authorities. Rail connections with Europe are also treated as an important element of local economic development strategies. The provinces are playing a major role in supporting specific connections through subsidies which were crucial for the market of rail connections with Europe to develop to its present size. At the same time, specific

provinces compete with each other mainly for attracting trade flows from other parts of China.

- Over the last 2-3 years, China's central government has been actively involved in the process of organising transport under the project known as CR Express. Beijing's main goal is to guarantee more balanced development of the transport market. The strategy for the development of rail connections with Europe in 2016-2020 assumes, for example, greater coordination in the process of organising transport, facilitation of the process of expanding China's logistical infrastructure, as well as Beijing's increased involvement in relationships with foreign partners along the Belt and Road. In the upcoming years, a consolidation of the connections should be expected alongside a reduction in the number of Chinese cities able to service the connections with Europe. Moreover, the introduction of a unified pricing policy and a reduction of subsidies are among the strategy's key points.
- In the operational aspect, the main institution responsible for the implementation of the strategy adopted by Beijing is the Chinese national rail carrier China Railway. In its form, the Organisation Committee for CR Express, established in 2017, led by China Railway and composed of seven biggest local connection operators, resembles a cartel in that it aims to limit competition between transport companies controlled by local governments. In Beijing's view, this competition is harmful.

Main stakeholders

- The launch of a specific route requires a wide-ranging consensus among all the states located along this route. Within these states it requires joint action by a number of institutions and companies that are important for the process. Chinese intermodal operators, which coordinate the transport of goods across specific states, are involved in organising a specific train connection. Due to varying infrastructure standards, in the states located along the route, the flatcars carrying the containers are transported by local carriers using their own locomotives. They are crucial in managing the transport system and act as a party in negotiations with foreign partners along the corridors. Other actors involved in managing the transport system frequently include local freight forwarding companies (that organise the transport of goods), customs officers, rolling stock owners and logistics infrastructure owners. Therefore, it is impossible to point to one

stakeholder, even the Chinese government, that would be able to operate and manage the process of transporting goods from China to the EU and *vice versa* on its own. Local governments can try to influence the shape and dynamics of the China-EU transport to the degree to which they control local carriers.

- The geographical structure of the China-EU rail transit and the use of specific transport corridors depend on the state of political cooperation and the consensus among all the stakeholders operating along a given route. It also depends on the active involvement of numerous state institutions. 'Soft' factors are of key importance for the cost, speed and promptness of transport. These include proper business standards, simplified customs procedures and formal solutions worked out under multi-party agreements. The price and duration of transport, as well as the intensity of use of a specific transport corridor, largely depend on these agreements and on the state of the infrastructure.
- China is striving to assume the role of coordinator in the expansion of the Eurasian transport corridors, including by devising technical improvements. A multi-party meeting of railway carriers during the Belt and Road forum in 2017 was among a series of initiatives that served this purpose. These plans are facilitated by the dominant position of Chinese companies in the organisation of train connections. On the other hand, their considerable decentralisation and the leading role of the provinces prevent Beijing from coordinating the activities at the domestic level and working out a unified stance. Leaving the task of shaping the rules of cooperation solely to Beijing is not in the interest of the states located along the route, including Russia and EU member states. Therefore, the key decisions regarding the development of transport corridors are still being worked out under regional agreements made by the states involved, as well as agreements by multilateral international organisations dealing with transport issues (OSJD).

The benefits for the EU and Central Europe

- In 2016, the added value for the EU states generated by the China-EU rail connection was around US\$ 0.28 billion. Approximately 72% of this value was generated by tariff settlements, 17% by logistic services connected with the distribution of goods on the EU market, and 5% by revenue earned on making rail infrastructure and rolling stock available to contractors. In

the next couple of years, trade turnover is expected to increase dynamically. As a consequence, by 2020 the total added value generated in the EU by this rail connection may reach more than US\$ 1 billion.

- The biggest part of the revenue will be earned by states that host logistics centres in which trains from China arrive and from which they depart. This will foster the development of companies operating in the transportation, forwarding and logistics sector and generate increased revenues from tariffs. The development of logistics centres supporting China-EU rail connections may be a development opportunity for those regions of the EU that struggle with structural problems.
- Companies from Central Europe have an opportunity to compete for a portion of the forwarding services market, even though a large segment of this market is already being serviced by global companies such as DB Schenker and DHL. Poland and other countries of the region can make their infrastructure available to contractors, offer logistics services and generate revenue from import tariffs on goods transported from China to Europe. Most revenue generated by the process of establishing the rail connection in itself is earned by Chinese companies that usually play the role of inter-modal operators. An increase in the number of transported containers will mainly translate into increased profit earned by the transport and logistics industries, while an increase in the value of goods will mainly translate into higher revenue from collected import tariffs.
- Fears that the rail connection may contribute to an increase in the trade deficit between Central European countries and China seem unfounded because from this region's point of view one-sided trade balance analyses may be confusing. A large portion of foreign trade flows between China and Central Europe remains beyond the control of individual states. This results from the fact that individual countries play various functions in the supply chains operated by global companies. In many cases, components produced in China are then assembled in Central Europe. The final product is later sold on the European market. From this perspective, providing a competitive manner of transporting goods from China by train may trigger an increase in the trade deficit between the states of Central Europe and China, but at the same time may cause a rise in the surplus they have with states which are end-product recipients.

The potential for building logistics centres in Central Europe

- Most probably, the optimisation of the China-EU rail connections, which Beijing is currently implementing on the Chinese side, will also cover the activity of Chinese intermodal operators in Europe. This results from the intention to generate savings on logistics by achieving economies of scale, increasing the effectiveness of carriages via the connections, and by aiming to gain control (at least partly) of the infrastructure available at terminals. The connections will be concentrated in several European logistics 'hubs'. This will concern industrial areas that have a major potential for generating the rail traffic of goods (using the model of creating a direct train connection between factories located in the EU and China). Similarly, locations that have a major logistical potential will be gaining importance. This will include the centres performing a consolidation of European goods on their way to China and the further distribution of goods imported to Europe. This is intended to foster an increase in carriage efficiency, including a greater use of the capacity of the trains.
- From China's perspective, Poland is an attractive location for providing logistical services to rail cargo traffic with Central Europe and to certain degree also with Scandinavia and the southern and eastern regions of Germany. It offers a favourable geographical location, low labour costs, and a relatively large logistics and warehousing base. One important asset is the big number of companies that offer road transport services at a competitive price. This type of transport is of key importance for the consolidation and distribution of goods across the EU. At present, the city of Łódź is playing the role of a 'hub', as it services around 25% of trains travelling from China to the EU and *vice versa*, accounting for around 7% of the value of transported goods. Another advantage of Poland is the strategic importance of the trans-shipment terminal in Małaszewicze on the Polish-Belarus border. At present, also Slovakia and Hungary are competing for the status of a Central European 'hub'. However, their role is currently limited due to the difficulties affecting transit via Ukraine.
- German cities too are hoping to increase their revenues from supporting rail connections with China. At present, Duisburg in North-Rhine Westphalia is playing the role of a logistics 'hub' for the territory of Germany, Benelux and northern France. Rail connections between the EU and China generate around 5.4% of rail trans-shipment operations carried out there. Due to the proximity of the main industrial bases that use the EU-China

rail connections, around 25% of trains, accounting for around 75% of the value of goods, are trans-shipped in Duisburg.

- So far, rail transport from China to the EU and *vice versa* has been performed using the existing logistics infrastructure. An increase in the intensity of this transport may trigger the need to build new terminals and logistics centres. China will most likely wish to participate in the terminal building projects as a majority stakeholder. From the point of view of European business, it would be of key importance to build logistics infrastructure that would be open and available to both Chinese and European companies. The final location of the hubs in the EU will depend on: the condition and traffic capacity of road and rail infrastructure (including a well thought-out modernisation strategy), favourable regulatory framework and price regime adjusted to the needs of intermodal transport, preferential customs clearance procedures (for example delayed import VAT payments), the adoption of suitable regulations for e-commerce, and improved cooperation between various rail carrier companies.

The structure of transported goods and the opportunities for business

- When choosing their preferred method for transporting goods, companies do not merely take into account the price and duration of transport. Every time rail transport is chosen, a number of business factors are taken into account: the geographical location of the goods, the value of the goods, their vulnerability to damage, their size. Security and promptness of delivery are also important, as well as its impact on the environment.
- According to estimates, around 65-67% of deliveries by train involve goods of a relatively high value. Dispatching this type of goods by rail is favourable due to the relatively small share of the cost of transportation in the price of these goods. At present, it is mainly electronic devices, electrical machines, pharmaceutical and chemical products that are transported from China to Europe by rail. For these types of products, delivery time is important and companies are willing to bear higher transportation costs. At present, this is the most frequent motivation for using rail transport.
- Usually, saving time is the most frequent motivation to use train transport between China and the EU as a way of direct delivering components and products between manufacturing plants. Certain transformations in China itself have contributed to the creation of supply chains that use new

methods for transporting goods. Differences in development standards between specific provinces convinced Western companies to move their production of components from coastal areas to inner provinces. When manufacturing plants that belong to one company are connected by rail, company owners rent entire trains to transport their goods. This solution is favourable for them both in terms of price and duration of transport. Due to the fact that a train is able to transport fewer containers than a ship, it can be fully contracted by one company, whereas the logistics connected with loading and unloading big container ships is much more complex and less flexible.

- The China-EU rail connection is popular with manufacturers of seasonal goods, including in particular clothes. Due to specific deadlines for launching new clothing collections, the producers often wish to save time and do not want to bear excessive transportation costs. Emergency deliveries of goods are another category of using rail transport. It sometimes happens that the client receives goods that does not meet all the criteria and standards specified in the order. If this is the case, sending additional batches of products is necessary, for example due to a strict merchandising deadline. In this situation, many clients choose delivery by rail, because they do not have a sufficient profit margin to afford to deliver goods by air.
- In 2014-2015, carriers managed to improve the organisational efficiency of the connection's logistics so that now it is possible to dispatch goods whose volume does not exceed the volume of one container. The opening of the rail connection to e-commerce has created an opportunity to transport at least a portion of the large market of parcels sent from Europe to China and *vice versa*. According to estimates, this market accounts for more than half of parcel traffic between Europe and the rest of the world. Rail transport may considerably increase the competitiveness of European producers on the Chinese e-commerce market.

Challenges to the development of EU-China rail connections

- The rapid increase in EU-China rail transport was only possible due to subsidies offered by those Chinese provinces that wished to boost their logistics potential. Usually, these subsidies involve grants to rail operators controlled by the governments of specific provinces and cities, which organise transportation. The total annual amount of subsidies can be estimated at US\$ 300 million. The subsidies, alongside the competition between the

provinces, trigger transport price fluctuations, disrupt logistics chains and frequently contribute to the fact that only a small portion of the trains' capacity is used.

- The question of balancing the train service from China to Europe and from Europe to China remains the key challenge for the development of rail connections. The rail transportation of goods from Europe to China accounts for approximately just one third of all commissioned trains. The costs resulting from unbalanced trade are mainly borne by the Chinese provinces, which increases the need to use subsidies. The task of finding clients who would use the rail connections regularly and would help meet the trains' capacity and guarantee the long-term profitability of these connections, is one of the main priorities of the Chinese provinces. This mainly concerns goods exported from Europe to China, because – paradoxically – the cost of sending empty trains, borne by the provinces, may motivate them to support imports from Europe.
- The Chinese leadership is becoming increasingly aware that, in the long term, the development of connections with Europe must be based on market mechanisms and subsidies must be gradually phased out. According to insider information, this is expected to happen around 2020-2022. However, the uncertain future of the subsidies, which depend on political factors, makes European actors involved in transportation reluctant for example regarding their investments to expand infrastructure.
- One important business activity that could help balance the profitability of the connection is the export of foodstuffs from Europe to China. This mainly concerns the premium food segment in which high profit margins could cover the relatively high transportation cost. However, at present this method of exporting food from Europe is suspended due to a Russian embargo which bans transit from the EU to China. Transporting foodstuffs by rail requires a strict observance of deadlines, and therefore customs clearance procedures would also need to be made more efficient. For European foodstuffs producers, the rail connection may be an opportunity to gain a competitive advantage over their main global competitors.

The potential of specific EU-China rail routes

- On the newly opened connections between China and the EU, the trade flows are executed using the easiest possible solutions, i.e. via transport

corridors that already have the biggest capacity, the best infrastructure and the most favourable legislative conditions. Due to their competitive advantage, the development of rail connections between China and the European Union has so far been almost exclusively based on the three trans-Siberian routes that run through Russia. At present, the biggest number of containers is transported using the corridor that runs via Kazakhstan and starts on the Chinese-Kazakh border crossing of Alashankou/Dostyk. The three corridors meet in the Urals near Yekaterinburg. Next, the goods are transported to the EU via Belarus and are unloaded onto standard European gauge flatcars in Małaszewicze on the Polish-Belarusian border. For political reasons, at present the transit from Russia to the EU via Ukraine is limited. A small number of trains from China have their terminus in the Baltic states.

- The trans-Siberian corridors have the best infrastructure of all existing routes. The use of trans-Siberian corridors is also facilitated by cooperation between the states that belong to the Eurasian Economic Union, i.e. Russia, Kazakhstan and Belarus. From the point of view of Chinese provinces that provide subsidies for the rail connections with the EU, at present the trans-Siberian corridors are the cheapest, the fastest and the safest option. They also offer the most favourable relation of costs to desired effects. Due to this, the routes running through Russia have received the biggest support from the Chinese central government and are a key element of China's strategies. Other important stakeholders in the development of trans-Siberian corridors are Russian Railways (RZD), including Kazakh Railways (KTZ) and Belarusian Railways (BZD) that cooperate with them.
- From Beijing's point of view, the use of the routes that run through Russia is of major political significance, because in the long term it weakens Moscow's potential objection to the Chinese New Silk Road project. At the same time, the dependence of all three trans-Siberian corridors on the Russian railway system enables Russia to use rail transport as a tool to exert political pressure on its neighbours. Russia's hostile approach (the transit blockade) and Beijing's unwillingness to develop cooperation have eliminated Ukraine from participation in rail connections between China and the EU. This has also strengthened the position of Belarus and Poland in the trans-Siberian corridors.
- The remaining states that wish to join the Belt and Road Initiative are taking measures to improve alternative transport corridors to make it possible

to redirect a portion of trade flows to them. The trans-Caspian land and sea corridors running through the Caspian Sea, the Caucasus and the Black Sea are one potential alternative to the currently used trans-Siberian corridors. However, the transport of goods using this route is much more complicated and requires complex intermodal solutions (such as ferry crossings). So far, the use of trans-Caspian corridors in rail container traffic with China has been insignificant and limited to non-EU states which are located along the corridor. Their future potential is limited by the relatively poor transport infrastructure, as well as certain formal limitations such as those regarding border clearance, the absence of unified regulations and technical standards, and varying transport costs.

- At present, Kazakhstan and Azerbaijan are the main stakeholders in the development of the trans-Caspian corridors because they see economic benefits in developing the logistics sector and the transit of containers from China to Turkey, and in expanding their own trade channels with Europe and China. They have also started cooperation with Ukraine, Poland and Romania. The future use of trans-Caspian corridors in the trade between China and the EU is uncertain due to the unclear stance taken by Beijing. These corridors have not yet received significant support from the Chinese central government and provinces, and this prevents the development of transportation on a large scale. The present calculations regarding increased use of the trans-Caspian corridors in the transit of goods from China to the EU and *vice versa* are based on the assumption that there could be disruptions to the smooth flow of transport via Russia. These could include the emergence of infrastructure bottlenecks and the potential destabilisation of states that are of key importance for their functioning, i.e. Belarus and Kazakhstan.
- Another potential alternative to China-EU rail traffic is the southern route that runs through Turkey. In this variant, the trains travel partly along trans-Caspian corridors (on the China-Georgia section), and then use the Baku-Tbilisi-Kars rail connection, heading for the European part of Turkey. The state of rail infrastructure in Turkey is the main problem here. From China's perspective, the present work on the development of the southern corridor is mainly intended to build permanent connections with Turkey. At present, the use of this corridor to establish regular connections with the EU is not considered favourable either by Beijing or by individual provinces. However, this route is mentioned in the CR Express strategy as a potential alternative route to the EU in the future. Turkey and the Caucasian

states are also interested in developing this corridor. Most actions intended to improve this transport corridor are carried out under cooperation forums which have been in place for years, such as the Transport Corridor Europe-Caucasus-Asia (TRACECA).

- China is also interested in developing the so-called China-Europe Land-Sea Express Line which is a maritime route connecting Chinese ports with the port in Piraeus in Greece. From there, goods are then delivered by rail to Central and Western Europe. This route coincides with the Pan-European Corridor X running through Macedonia, Serbia and Hungary. However, the Balkan route is not a simple alternative to land-based rail connections; it is rather a means of reducing the duration of maritime transport from China to the EU. Due to certain infrastructure limitations, so far rail transport via the Western Balkans has not reached its full potential. Additional limitations include the relatively poor 'soft' infrastructure such as simplified waybill formats and customs procedures. This is particularly important in the context of potential competition between Western Balkan ports and ports in northern Europe. On the Chinese side, the main stakeholder in the development of this corridor is COSCO, the owner of the port in Piraeus, involved in developing trade flows on this route. The development of the land-sea route via the Balkans should be viewed as an attempt by China to increase its share in the market of maritime container traffic between China and the EU. China's involvement in expanding transport corridors via the Balkans has sparked major controversy within the EU.

I. CHINA'S GOALS IN DEVELOPING RAIL TRANSPORT BETWEEN CHINA AND THE EU

The development of Eurasian transport corridors connecting China and Europe has become one of the key elements of the vision announced by China's President Xi Jinping involving the construction of the overland part of the Belt and Road Initiative (the so-called Silk Road Economic Belt). One symbol of China's initiative frequently referred to by Chinese diplomats and media is a cargo train travelling through Asia. Although in the 2013 speech in Astana that marked the launch of the initiative the issue of rail connections was not mentioned explicitly, the market of rail carriages from China to the EU and *vice versa*, which was then in its initial phase, was quickly placed under the 'umbrella' of this initiative. This market had started to develop in 2008 as a result of private and grass roots initiatives. A clear signal of support given by Beijing triggered major financial and organisational investments carried out by the local authorities of Chinese provinces. **As a consequence, the 2013 announcement of the Belt and Road Initiative has become a turning point for the development of the China-EU rail transport market. It provided it with a new dynamic that mainly depends on the goals and actions of the Chinese side.**

A development policy tool. From Beijing's perspective, the Belt and Road Initiative is intended to support the Chinese regional development strategy that aims to reduce developmental gaps between less affluent provinces in the country's centre and west and the better-developed coastal regions. The initiative is an element of a series of projects of building economic 'belts' included in the 13th Five-Year Plan. These 'belts' are to connect the inner provinces with the coastal regions to alleviate developmental gaps and to coordinate the provinces' economic policy¹. In the development-related aspect, the Belt and Road Initiative complements these strategies and is intended to facilitate the development of transport corridors running from China's inner regions westward. The launching of rail connections with Europe is an element of Beijing's long-term policy that promotes trade with Central Asia and Europe and facilitates the inflow of foreign investments to China's inner provinces. So far, these provinces' trade with foreign partners has been negligible – according to Chinese statistics in 2015 the central and western provinces accounted for a mere 5% of total trade with the states of the Belt and Road Initiative.

¹ The Yangtze River Economic Belt (encompassing for example Sichuan, Chongqing, Hubei and the coastal provinces of Zhejiang and Jiangsu), is a key strategy of this type, as is the Hebei-Beijing-Tianjin region.

Support for China's expansion abroad. China's involvement in building rail connections with Europe is intended to boost the role of Chinese companies in EU-China trade as a whole along the entire value chain (forwarding, transportation, logistics infrastructure). At present, European ship-owners and logistics companies are using the two leading modes of transport, maritime and air transport, to effect a major portion of their trade. China's involvement in rail carriages is intended to increase its control of deliveries of products that are of key importance from China's perspective (including high value products) and to boost the share Chinese companies have in the profits from supporting trade with the EU. In the longer term, this may help China gain a competitive advantage in the high value goods market (for example, electronic devices) because it offers domestic manufacturers an opportunity to organise faster and cheaper deliveries to the EU as compared with manufacturers from Japan and Korea².

The integration of the Belt and Road states with China. In Beijing's view, the rail connections are the core of the 'economic belts' abroad. As such, they are intended to facilitate China's economic expansion in states located along the Belt and the Road. There are plans to build industrial parks along the railway routes to attract Chinese investors. This, in turn, may translate into increased trade and more frequent interpersonal contacts, and could boost tourism. Examples of such activities include the industrial park in Khorgos in Kazakhstan and the Great Stone Industrial Park in Belarus.

An instrument of diplomacy. Trade connections have been given clear priority in the promotion of the Belt and Road abroad. Behind this approach were the prospects of achieving instant and tangible effects, the international fame of the trains that are to 'connect' two continents (which is favourable for China) and the project's indirect relation to the expansion of transport infrastructure in Europe and Asia (in which China wants to participate). A 'joint welcome' of the trains is now organised during bilateral and multilateral meetings. For example, at the '16+1' summit in Latvia, a joint welcome ceremony was offered to the Yiwu-Riga train, and the arrival of trains from China was an important element of President Xi Jinping's visit to Poland in 2016. The launch of new routes is frequently presented as an important element of bilateral relations. One example of this is the 2017 launch of the train service from Yiwu to London that received major media attention.

² At present, both states are trying to develop their own connections with Europe via the Russian Far Eastern ports or using transportation services offered by China.

1. Chinese provinces as the driving force of cooperation

Initially, the new rail routes ran mainly through the central provinces and cities such as Chongqing, Sichuan, Henan and Hubei. President Xi Jinping's 2013 announcement of the Belt and Road Initiative triggered a surge in the number of provinces involved in rail transportation to the EU. In subsequent years, the drive to launch rail connections with the EU spread throughout China – regular train service to Europe was opened also in coastal provinces such as Tianjin, Jiangsu, Liaoning, and also in western provinces including Xinjiang and Qinghai. In 2013-2017, over 61 regular rail connections were launched connecting 38 Chinese cities with 36 European cities (see Map 1). The organisation of carriages became much simpler after the rail transport corridors from China to the EU running through Sichuan and Chongqing had been provisionally 'opened'. This enabled other provinces to establish their own connections with Europe. It is noteworthy that the task of organising new connections was most often entrusted to local governments – the job of establishing state-controlled rail operator companies belonged to province-level bodies, cities, and local development institutions (such as the management boards of special economic zones). This is how the state-controlled companies established by local governments, such as Zhengzhou International Hub and Chengdu International Railways, became involved in the organisation of carriages. In some cases, local state-controlled companies took over the organisation of connections that had been created by private business. As a consequence, **Chinese local governments have become the main actors in the development of rail connections between China and the EU.**

The first EU-China connections

In their present shape, rail connections between China and Europe are mainly based on the model worked out in 2008-2014 in China's two south-western provinces: Sichuan and Chongqing. This model was based on logistical solutions developed by the private sector, mainly by multinational corporations, in cooperation with the governments of the two provinces. Due to an increase in labour costs in China's coastal provinces, in the first decade of the 21st century a portion of foreign investors from the electronic and automotive sectors launched a process of relocating their manufacturing plants to the inner parts of China, including to Sichuan and Chongqing provinces. The unique nature of the products, the distance from Chinese ports and the relatively high level of utilisation of the Chinese railway system recorded at that time all made rail transport from western China

direct to Europe a favourable solution. Starting in 2008, Trans Eurasia Logistics, a joint venture created by German railways (DB) and Russian railways (RZD), in cooperation with Chinese rail carriers, began to develop rail connections with Europe, with the chief intention of servicing global producers of electronic devices and machines (Siemens, Hewlett Packard). Simultaneously, a Polish company Hatrans, in cooperation with Chengdu International Railways, started to develop a similar model of transport to connect the Dell manufacturing plants in Łódź and Chengdu. After several years of tests and attempts to select the most suitable routes, in 2011-2013 the first regular connections from China to Europe were opened on the routes Chengdu-Łódź, Chongqing-Duisburg and Zhengzhou-Hamburg, mainly to service global producers from the electronic and automotive sectors. The first connections demonstrated the large potential of this mode of transport and helped to develop certain logistical solutions necessary for the transportation of goods and to devise the formal procedures and principles of cooperation between railway carriers.

The political logic. The political goals of Chinese local governments involved in building new rail connections with Europe are related to the internal political aspect of the Belt and Road Initiative. By fleshing out the vision presented by Xi Jinping with genuine content and demonstrating an active approach towards the plans adopted by Beijing, local government officials are attempting to obtain political benefits. This is particularly important due to the central government's growing influence over how the provinces are governed, which is typical of Xi Jinping's first term. Alongside the development of political, business and interpersonal contacts with the European Union, rail connections with Europe are among the long-term goals of China's foreign policy. Attempts by Chinese local governments to support Beijing's line of thinking are impacting the dynamic of the development of rail connections, thus politicising the whole process to some degree. For example, the selection of a specific route's terminus is not always made based on a purely economic calculation, but on a political goal. This goal involves the intention to establish a connection with a specific city or country in the EU, rather than to choose an optimum location from the point of view of economic interest. Due to their strong political motivation, representatives of even those regions of China that have a minor logistics potential try to find the European partners necessary for handling the connections. In some cases, the interest on the part of Chinese local government officials is limited to their participation in the opening ceremony of a specific route and its media coverage. This results for example in subsequent problems with maintaining a regular train service on these routes.

The economic logic. The Belt and Road Initiative, as well as the rail connections with Europe built as part of it, are viewed as an important element of local economic development strategies. Over the last decade, major investments have been carried out in central China involving the transport infrastructure expansion of river ports, airports, motorway and railway networks. As a result of this, several intermodal hubs (i.e. hubs offering many modes of transportation) were created. The main centres of this type are located in Chongqing (the largest inland port on Yangtze river), Zhengzhou (one of China's major railway hubs) and Chengdu. At present, direct rail connections with Europe are an important element of the development strategies of Chinese transport hubs and also of plans to attract China-EU trade flows. Currently, 90% of the overall trade with Europe passes through ports in coastal provinces. Aside from seeking trade partners in Europe, local governments are involved in expanding the network of intermodal connections with other Chinese provinces and other Asian states. In doing so, they intend to redirect the container transport flows to local inland hubs, and then to send them to Europe by rail. Increased trade flows are expected to benefit local companies operating in the sectors of logistics (intermodal operators, warehousing agents, trans-shipment companies) and business services (financial and customs services). Industrial parks and pilot free trade zones are being built around container rail terminals. Aside from bringing the expected benefits from trade-related services, these actions are intended to attract foreign investors. The presence of a regular rail connection with target markets and production bases in Europe is taken into account when deciding on the location of manufacturing plants in western China, for example the plants of electronics producers in Chongqing and Sichuan.

The role of subsidies. The logic of developing rail connections with Europe applied by Chinese local governments to date has largely been based on the assumption that an intervention on the part of the state, both as regards infrastructure investments and the organisation of carriages, is a precondition for business activity to be stimulated and major trade flows to be launched. Although as regards the intensity of rail transport, the Eurasian rail connection market is still in its initial phase, some Chinese provinces have made considerable investments in the infrastructure intended to service these connections. For example, in the capital of Sichuan province, a dry rail port was built for 12.5 billion yuan (over US\$ 1.8 billion). It has been organised so that it is able to service the import of automotive parts and foodstuffs from Europe, among other things. **Subsidies are the basic instrument for supporting rail connections. Although the exact amount of these subsidies has not been officially revealed, according to representatives of the European logistics industry,**

they are instrumental in the market developing to its present size. According to information from the industry, the subsidy for a single container (a forty-foot container) is around US\$ 2,000-4,000. The provinces that are the most actively involved in this process spend over US\$ 30 million annually on subsidising regular freight train connections³. Assuming that the average subsidy per container is US\$ 2,500, at present the total fiscal burden the provinces have to shoulder is about US\$ 200-300 million annually⁴.

Intra-Chinese competition. The competition between Chinese provinces, that has been ongoing for years, has spread onto the field of rail connections with Europe. It is evident as early as at the stage of establishing the connections and seeking partners in Europe, and frequently takes the form of sending competing teams of representatives to individual European countries. In the case of connections that are already operating, Chinese provinces mainly compete to attract trade flows from other parts of China. Aside from political and development-related motivation, the reason behind this competition is the need to obtain a return on infrastructure investments. The provinces carried out these investments hoping for a rapid increase in rail trade with Europe. This concerns in particular several neighbouring central provinces (Hunan, Sichuan, Hubei, Chongqing, Shaanxi) that aspire to the role of the most important logistics land hub along the Belt and Road. Exporters from the remaining Chinese provinces are tempted mainly by various types of ‘promotional’ subsidies: from a provisional reduction of the standard fee for transporting one container from a local terminal to Europe, through providing free delivery of goods from other locations in China (for example within a 1,500 km radius) to the terminal, to direct subsidies offered to producers. The price war waged by the provinces results in strong pressure on the cost of transportation (by increasing the amount of subsidies, sometimes to several dozen per cent of the container transportation price), considerable carriage price fluctuations and a disruption of logistics chains (sometimes freight forwarders send their goods not to the nearest terminal, but to terminals that offer ‘special’ prices and are located several hundred kilometres away).

³ This figure was recorded in 2014 – the present intensity of transport is much bigger, which means that the scale of subsidies is also bigger.

⁴ The calculation is based on data pertaining to 2016 trade flows (153,000 TEU) and the estimated number of trains in 2017. The estimated level of subsidisation has been based on information from industry representatives and the Landbridge Logistics Alliance report, see <http://www.landbridgenet.com/landbridgetransunion/2017-04-26/45524.html>

2. China's central government as the new leader of creating connections with Europe

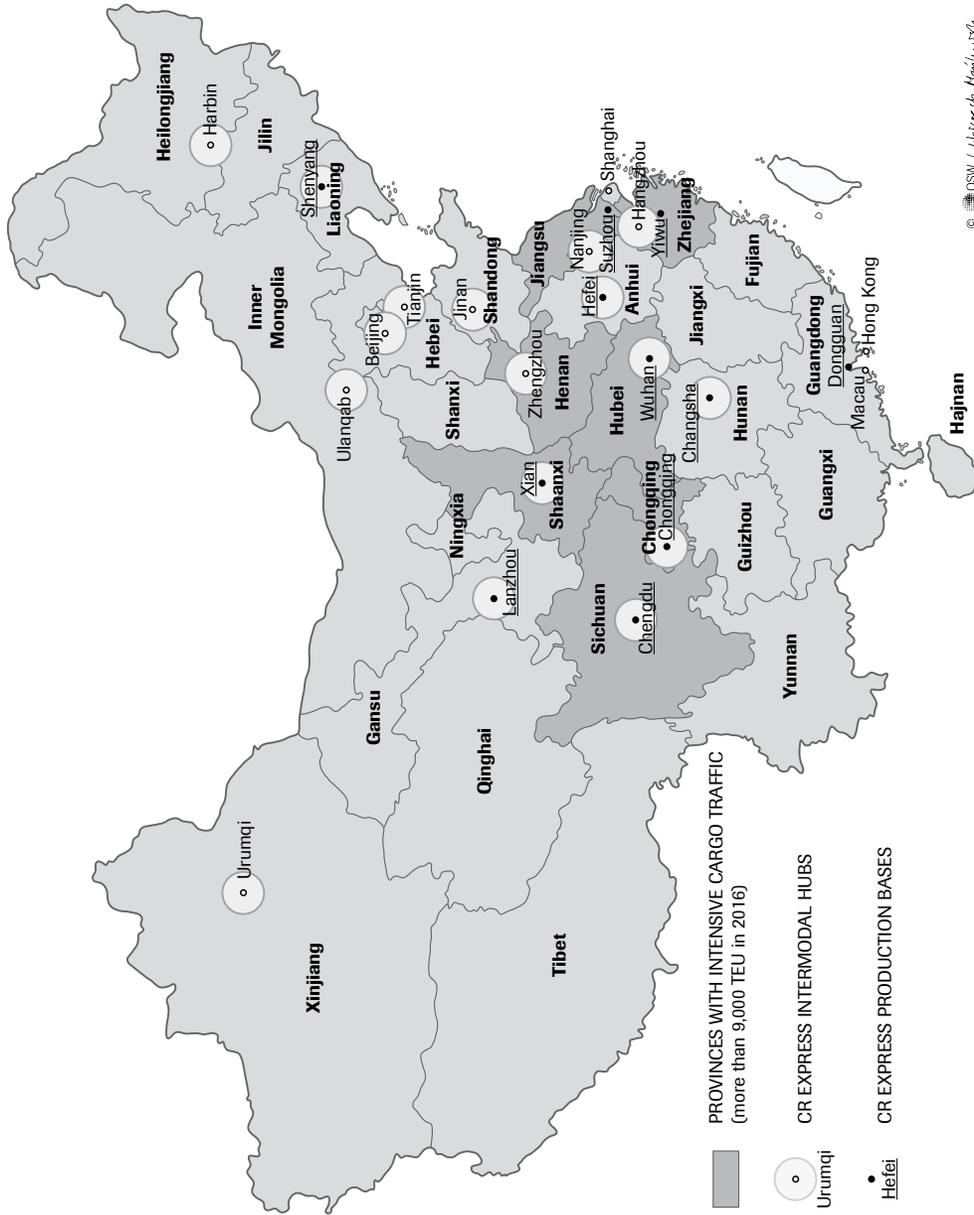
In recent years, the central government has been stepping up its direct involvement in the organisation of rail transport between China and the EU. Beijing intends to improve the internal coordination of how the market is developing and boost the role of market mechanisms. However, this is being met with strong resistance from Chinese provinces.

Coordination at the central level. The competition between Chinese provinces has made the process of developing the rail connections very dynamic, which from Beijing's point of view was initially favourable. However, as the intensity of this mode of transportation increased, its negative consequences began to emerge. This has led to the involvement of the central government in the coordination of the process as a whole under the project referred to as CR Express (*zhongou banlie*). The National Development and Reform Commission (NDRC), which in October 2016 announced the plan for the development of rail connections with Europe in 2016-2020⁵, has become the main actor in setting the goals for the development of the transport sector. Examples of what the vision outlined in the document provides for are: the greater coordination of the process carriage organisation on the part of Chinese carriers, improvement of the process of expanding logistics infrastructure in China, and Beijing's increased involvement in relations with foreign partners along the Belt and Road. Beijing's actions are mainly intended to solve China's domestic problems, including to reduce the financial burden associated with subsidies and the risk of excessive infrastructure investments. From Beijing's perspective, the basic problem involves the very high number of overlapping connections that subsequent cities open, frequently disregarding their economic aspect. **In the upcoming years, there are plans to consolidate the connections, and to reduce their number and the number of Chinese cities authorised to perform rail transports to Europe**⁶. The main goal is to adjust the connection grid to China's main production and logistics bases, which in turn is expected to boost the trains' profitability.

⁵ 中欧班建设发展规划 (2016-2020) - (CR Express development plan for 2016-2020); <http://www.ndrc.gov.cn/zcfb/zcfbghwb/201610/P020161017547345656182.pdf>

⁶ The document reduces the number of cities that have the potential for generating proper trade flows to 11. It is only these 11 cities that are to be allowed to develop rail connections with Europe on a bigger scale. Goods from the remaining parts of China are to be directed to and consolidated in the nearest rail hubs, and then dispatched to Europe. See Map 1.

Map 1. China's CR Express strategy. Provinces and cities selected to serve as logistics hubs



One of the key points in this strategy is to introduce a unified price policy in order to eliminate the ‘disorderly’ competition among the provinces. It is also intended to improve China’s negotiation position in price talks with foreign partners involved in the carriages (so far the negotiations have been performed separately by operators from specific provinces) and help it gain a dominant position (*zhudaoquan*) in setting the price of rail freight. This in turn is intended to increase the competitive advantage of rail transport (over other

means of transportation) by reducing its cost. The CR Express development plan also provides for Beijing's increased involvement in creating 'soft' infrastructure for carriages including the standardisation of waybills and simplification of customs clearance procedures. These actions are also intended to increase China's impact on the development of the rail transport sector across the globe.

The role of China Railway. In the operational dimension, the main institution responsible for implementing Beijing's strategy is the Chinese national rail carrier China Railway. Since 2014, Beijing has been making attempts to gain greater control of the organisation of carriages. Initially, these attempts met with strong resistance on the part of local governments and the transport companies they controlled, which were sceptical of Beijing's actions⁷. The actions by China Railway only gathered momentum when the NDRC became directly involved in them and when in the second half of 2016, at a meeting of the Small Leading Group for Advancing the Belt and Road, the highest representatives of the Communist party announced their support for the initiative. As a consequence, in May 2017 the Organisational Committee for CR Express was established, led by China Railway and grouping the seven biggest local rail connections operators⁸. **In its form, the newly created tool for coordinating rail connections with Europe resembles a cartel in that it aims to limit the competition between transport companies controlled by local governments. In Beijing's view, this competition is harmful.**

Representatives of Chinese government circles are becoming increasingly aware that in the long term the development of the connections with Europe needs to be based on market mechanisms and the subsidies need to be progressively abandoned. According to insider information, this is expected to happen around 2020-2022. However, the implementation of Beijing's plans to curb the harmful price competition and to adjust the structure of rail connections to actual trade flows is still uncertain. **The resolution of these key issues depends on the actual impact of the newly created coordination structures on local governments that act in their own interests.** Their position is relatively strong because they control the key 'assets' including the logistics infrastructure and business contacts with cooperating partners along the Belt and Road. The tension between the central government and the

⁷ Caixin, 中欧班列整合开局 (Early stage of CR Express integration), 19 June 2017, <http://weekly.caixin.com/2017-06-16/101102651.html>

⁸ These include rail companies from Chongqing, Chengdu, Zhengzhou, Xian, Suzhou, Wuhan and Yiwu.

provinces also results from the absence of a consensus as to who, in a situation of centralisation, should be financing further subsidies to the connections (at least in the transition period). **The uncertain future of the subsidies, which depend on political factors, makes European actors involved in the carriages cautious, for example when making decisions regarding infrastructure expansion investments.**

At the same time, the CR Express committee is trying to act as a coordinator in the process of eliminating barriers to market development that have an international dimension. This includes optimising the connection grid, expanding the offer of insurance services and working out documentation standards. One of the main achievements to date has involved the delivery of a large number of containers bearing the CR Express logo to rail carriers. These containers are already being used in rail trade with Europe⁹. CR Express is also taking part in negotiations with foreign partners – in May 2017 during the Belt and Road forum in Beijing it acted as a party to an understanding on giving priority to EU-China connections.

⁹ This has both promotional and practical significance – it unifies the brand and shifts a portion of responsibility for completing the container cycle onto CR Express. See Chapter II.1.

II. RAIL CONNECTIONS BETWEEN CHINA AND THE EU: THE PRESENT SHAPE AND THE PROSPECTS

The annual number of trains that have travelled on the routes covered by the China Railway Express project constitute the main statistics which the Chinese side is using to promote rail connections¹⁰. According to CR Express data, the dynamic of rail carriages between China and Europe is growing – in 2011-2016 the annual number of carriages rose a hundred-fold, from 17 to 1702. During the record-breaking 2017, 3,673 freight trains travelled between China and the EU. Since 2011, the annual increase in the number of carriages has been around 100-150%. The figures cited by the Chinese side coincide with data published by Russian Railways which use TEU (twenty-foot containers) as a unit to estimate the volume of transit between Europe and China. According to data published by Russian Railways, the number of containers transported via Russia on the route from China to the EU and back rose gradually and reached 44,200 TEU in 2014, 81,100 TEU in 2015 and 153,000 TEU in 2016. However, these volumes remain modest when compared to maritime transports. In 2016 more than 10 million TEU were shipped from China to Europe using cargo vessels¹¹.

With no official statistics available, it is particularly hard to estimate the value of goods transported using EU-China rail connections. According to press reports, in 2016 the four largest Chinese logistical centres that perform EU-China rail carriages (namely Chengdu, Chongqing, Zhengzhou and Suzhou), trans-shipped goods with a total value of US\$ 20.8 billion¹². When lesser terminals are added, the overall value of goods transported by rail can be estimated at US\$ 22.9 billion¹³. This means that in 2016 about 4% of the overall EU-China

¹⁰ No detailed structure of carriages covered by this calculation has been revealed – however it should be assumed that Chinese statistics cover connections with Europe as a whole (including with Russia and Belarus), not only with EU member states. More specific data suggests that most routes lead to EU member states.

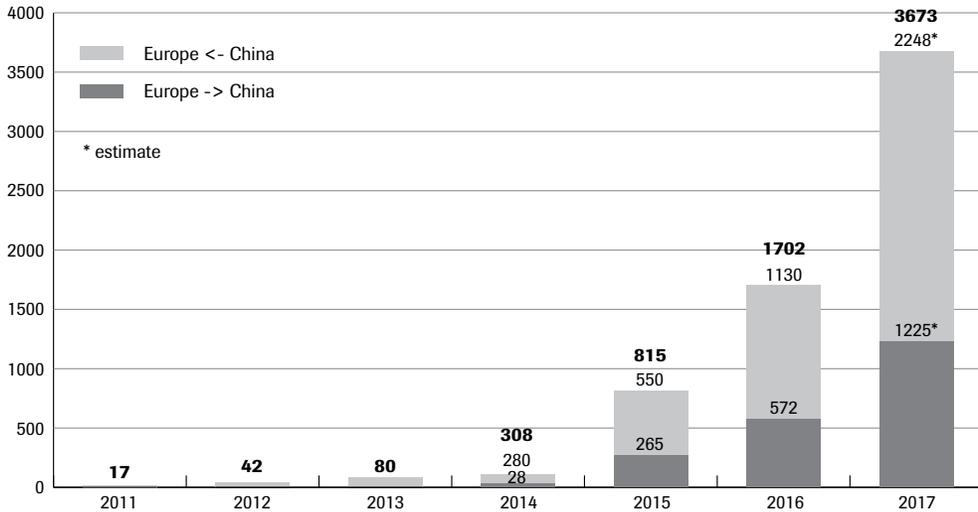
¹¹ Containers from Asia to Europe down 1.2% in 2016, *Container News*, 21.02.2017, <http://container-news.com/containers-asia-europe-volume/>

¹² 2017年中欧班列步入发展“快车道”成都重庆计划“运力翻倍” (CR Express expected to enter the ‘fastlane’: Chengdu and Chongqing plan to double their capacity), 21 Shiji Jingji Baodao, 02.09.2017, http://epaper.21jingji.com/html/2017-02/09/content_55645.htm

¹³ Due to special features of Chongqing-Duisburg connection, the value goods in 465 trains transhipped by lesser terminals were estimated by multiplying this number by the average value of a train transhipped in Chengdu, Suzhou and Zhengzhou (about US\$ 4.6 million).

trade value was transported using trains¹⁴. In 2017 the number of containers transported doubled when compared to 2016, therefore the share of rail transport in overall EU-China trade will rise.

Chart 1. Number of cargo train journeys on the China-Europe route, 2011-2017



Container rail carriages

The dynamic development of the China-EU rail carriage market is based on the model of a so-called ‘block-train’, which considerably reduces the duration of carriage. Containers are collected in the entry terminal (in Europe or in China) and then they are collectively transported to their destination. This grouping considerably accelerates the carriage (compared with the shipment of single containers) because it enables operators to arrange the dispatch of goods on an ongoing basis and also because it simplifies customs clearance procedures. It also contributes to increased predictability and the promptness of carriages. One train can transport around 40 forty-foot containers (on the most popular route via Kazakhstan). Due to the differences in gauge in the countries of the former USSR (1,520 mm) and in Europe and China (1,435 mm), at border points the containers are moved onto suitable flatcars (wagons). End customers are usually offered intermodal solutions (that use several different means of transportation) - after reaching the

¹⁴ The value of 2016 EU-China trade can be estimated at US\$ 571.2 billion (using the average yearly exchange rate of US\$ 1.11 to 1 euro), http://trade.ec.europa.eu/doclib/docs/2006/sep-tember/tradoc_113366.pdf

end terminal the goods are sent to other rail terminals or directly 'door-to-door' by road transport.

At present, two types of carriages are offered on the market: the so-called private train and public train. Private train is launched on the date that suits one specific client, frequently in the form of a regular train service. Due to the minimum cargo size of 40 containers, this type of carriage is mainly used by big multinational companies. Public trains, where single containers can be shipped, travel on regular pre-arranged dates. The use of this type of train is connected with a higher risk that the train's capacity will not be used in full.

1. Main challenges to China-EU rail transport

The key challenge to the development of the Eurasian transport corridors is how to balance the number of carriages from China to Europe and those from Europe to China. Due to its impact on the trade balance with China, at present this issue has been given high political priority in the EU¹⁵. However, balancing goods flows is important also from the point of view of the organisation of the carriages in itself. The evident disproportion to Europe's disadvantage (in 2015-2017 rail carriages to China accounted for a mere 1/3 of the number of launched trains) has far-reaching consequences for the profitability of these carriages¹⁶. Due to a significant surplus of carriages from China to Europe, a large number of flatcars pile up in locations where track gauge changes, most frequently in Brest. Due to limited storage possibilities, the operator responsible for the organisation of a specific train has to bear the cost of transporting the flatcars back to the vicinity of the Chinese border (within a deadline specified by their owner, for example within 14 or 30 days). Containers are transferred to Europe along with the goods they contain. They can then be sold, recycled, transported by sea or stored at the terminal (waiting for the next load of goods), but this is costly¹⁷. One method to optimise the cost is to send empty containers back to China by rail. This means that an increase in the number of trains sent from Europe to China is not necessarily tantamount to an increase in trade, as some container are shipped back empty. Therefore, the statistics that compare

¹⁵ For a more detailed discussion see Chapter IV.4.

¹⁶ This phenomenon is also observed in maritime trade – it is estimated that around half of the total number of containers transported by sea are empty mainly due to the disproportion of trade between Asia and the rest of the world.

¹⁷ Some containers are used in EU-Russia trade and cover a portion of the distance in this way.

the number of trains travelling in either direction are misleading when it comes to trade flows, especially given that the loading capacity of trains travelling from China to Europe is met to a larger degree than it is the case with trains travelling from Europe to China.

The differences in the geographical location and the economic structure of individual provinces of China and the regions in Europe with which they are connected have a direct impact on the key characteristics of each specific rail connection, including its profitability, transportation costs and the potential for meeting the train's loading capacity. Usually, trains departing from Europe to China are filled to a much smaller degree than the trains travelling on the route from China to Europe. For example, in the Łódź-Chengdu train, the container capacity (the proportion of containers filled with goods to the total number of containers) is a mere 17%, whereas in the trains travelling in the opposite direction the figure is around 63%¹⁸. For other routes, where the operators publish the corresponding statistics, for example the Shilong-Duisburg train, the ratio is 79.6%.

Attempts to find clients who would use the rail connections regularly and would help meet the trains' capacity and guarantee the long-term profitability of a specific train service, are among the priorities of the Chinese provinces. This mainly concerns goods exported from Europe to China, because paradoxically the cost borne by specific provinces may motivate them to support imports from Europe. In specific terminals, the import from Europe of various categories of goods (for example fruit, meat, cars) is being regulated by way of licences issued in Beijing. This is why the Chinese provinces make every effort and compete with each other to obtain licences for the import of specific types of goods, wishing to 'seize' specific flows of goods incoming from Europe. Another method for supporting imports is by setting prices – for some routes the cost of sending a container from Europe to China is sometimes much lower than the cost of sending one from China to Europe. The need to subsidise carriages largely results from the fact that it is necessary to cover the cost of the train's return journey to China, when the train is frequently empty. From the point of view of a local operator, any type of European good that is loaded onto the pre-paid train travelling back to China reduces the need to subsidise the carriage.

¹⁸ A presentation of the Chengdu+ strategy, Łódź, June 2017.

2. Carriage organisation and handling – the need for international cooperation

From the point of view of the cost, the speed and the promptness of carriages, ‘soft’ factors are of great importance. These include proper business standards, simplified customs clearance procedures and formal solutions worked out under multilateral agreements¹⁹. Launching a train service on a specific route requires broad consensus from all the states located along this route. Within these states it requires joint action by a number of institutions and companies that are involved in this process. **The cooperation-based nature of carriages generates far-reaching consequences for the shape of the market currently being formed, the stability of the train service and the geographical structure of the routes.**

The process of organising a train

Regardless of the status and the country of origin of the operator that organises the carriages, the present model of carriage organisation requires the multi-level cooperation of all the states situated along a specific transport corridor, as well as the involvement of a large number of market players. One reason for this are the differences in technical standards applicable in specific states (the track gauge, traction technical parameters, voltage), as well as legal regulations and experience on local markets that promote local carriers. As a consequence, the trains travelling from China to Europe require multiple swaps of flatcars (a switch to wider tracks when leaving China and back to narrower tracks when entering the EU) and locomotives. For example, for a train travelling from China to the EU via the central Asian corridor, the cooperation of rail carriers from China, Kazakhstan, Russia, Belarus and Poland is necessary. These carriers each dispose of rolling stock that is suited to local technical and legal standards. The cooperation process also requires the involvement of the owners of flatcars (which are frequently affiliated to national carriers) and national rail agencies that book specific train services. In addition, depending on the local situation, the organisation of carriages sometimes requires the involvement of container lease companies, the owners of rail terminals, customs agents etc.

¹⁹ For example, according to CCTT, the 2013 data for the trans-Siberian route suggests that the fact that waybills were incorrectly filled in and delivered accounted for as many as 64% of cases in which goods were stopped at the border, whereas additional customs procedures and infrastructure faults accounted for a mere 16% of these cases.

Due to the complexity of the process, the successful organisation of carriages fully depends on the consensus of all the parties involved.

The development of rail connections between China and the EU fully depends on the advancement of international cooperation between local carriers and infrastructure operators in the states located along a specific route. It is their decisions that impact the final carriage timetable and the priority given to particular trains, and this determines the length of time a train spends waiting to use specific sections of infrastructure (on rail routes cargo trains are obliged to 'give way' to higher priority trains, for example passenger trains and other cargo trains)²⁰. Similarly, local regulators set transport rules and regulations that are of key importance for international transit traffic, as well as other additional regulations including reduced fare for the shipment of empty containers. However, the final decision regarding the organisation of carriages rests with local rail carriers that control the rolling stock and frequently also the key infrastructure (for example the sidings and the flatcars). Due to the reach of their activity – they are often major companies that hold a nationwide monopoly – local carriers are the dominant driving force in the entire process, even more powerful than local governments, and are the main negotiation partners for the Chinese side. **The market in this shape has political implications – it is impossible to point to a single actor, even the Chinese government, that would be able to handle China-EU transportation on its own²¹. The governments of the states located along a specific route are then capable of shaping the form and the dynamic of China-EU transportation to the degree to which they control the local rail carriers.**

The political cooperation between the states located along specific routes is another factor of key importance for the development of rail connections between China and the EU. The number of border clearances needed, the complexity level of customs procedures, and the presence of technical standards to guarantee the required traffic capacity of a specific transport corridor, all

²⁰ The rules of how infrastructure can be used are different in individual states – for example EU law makes it possible to split the activities performed by the carrier and the infrastructure operator. This facilitates the operation of foreign carriers on specific EU markets (in Poland, these carriers include Deutsche Bahn). The situation is considerably different in the remaining states located along the route (Russia, Belarus, Kazakhstan), where the entire process is controlled by national carriers.

²¹ Due to the paramount importance of subsidies, in the end the launch of a regular train service depends on China's decisions. However, it is a foregone conclusion that Chinese operators will cooperate with local companies along the route.

depend on this cooperation. For example, the creation of a customs union in 2012 that introduced a unified tariff in Russia, Belarus and Kazakhstan was one of the processes that laid the foundations for the present dynamic of rail transport. For example, it reduced the number of customs clearance stops needed at the border from four to two (when the train travels through all three states): on the Polish-Belarusian and the Kazakh-Chinese border. This has contributed to a reduction in the travel duration by around 4-6 days. Another consequence of the introduction of the customs union has been a partial integration of the rail and logistics sector aimed at eliminating the barriers to rail transit and at harmonising legislation. This has been accompanied by the introduction of a unified waybill for goods transported by rail, worked out by some of the EU member states and the CIS countries back in 2006. Simplifying the formalities and offering 'soft' infrastructure are mainly the tasks of the states that are located along a specific route. However, for these solutions to be possible, a number of multilateral agreements need to be worked out and implemented. **Therefore, the geographical structure of the China-EU rail transit routes and the utilisation of specific transport corridors depend on the advancement of political cooperation and consensus among all the parties involved in managing a specific route, as well as on the active involvement of numerous state institutions.**

III. THE DEVELOPMENT OF CHINA-EU RAIL TRANSPORT CORRIDORS

Since the 1990s, the development of rail transport corridors between Europe and East Asia has been the subject of numerous international initiatives including the work under the United Nations Economic and Social Commission for Asia and the Pacific, the CAREC²² programme and the Transport Corridor Europe-Caucasus-Asia (TRACECA). Under these initiatives, a number of actions of key importance for boosting the China-EU rail transport have been implemented, including the construction and modernisation of railway routes, the improvement of customs and border clearance procedures, the unification of waybills, and attempts to increase the safety of carriages. The Russian-inspired economic integration in the post-Soviet area has been an important driving force behind the elimination of formal barriers to Eurasian transport corridors. The former ‘bottlenecks’ in Central Asian infrastructure have been gradually eliminated owing to the involvement in the process of funds and know-how provided by external actors including Japan, the EU, the Arab states and the USA. Some infrastructure investments have been carried out independently by the resource-rich countries of the region including Kazakhstan and Azerbaijan.

Since the beginning of the 21st century, China has been increasing its involvement in the transport and logistics infrastructure sector in Asia, including by funding projects and offering cost-effective construction works. However, it is still the international institutions, mainly those participating in the CAREC programme, that play the most important part in the process of expanding the transport corridors. The situation is similar when it comes to creating ‘soft’ transport infrastructure, where the negotiations over the elimination of formal barriers are mainly being conducted in specialised forums and multilateral international organisations including the Organisation for Cooperation of International Railways (OSJD) and the Intergovernmental Organisation for International Carriage by Rail (OTIF). China plays a minor role in the process of simplifying customs clearance and formal procedures, although Beijing has clearly expressed its readiness to assume the role of coordinator²³.

²² It groups 11 states of the region and six international development banks including the Japanese-led Asian Development Bank, the World Bank, the European Bank for Reconstruction and Development and the Islamic Development Bank. Over 2001-2015, they funded projects focused on transport, trade and energy worth over US\$ 27 billion. See <http://www.carecprogram.org/index.php?page=carec-projects>

²³ See 中欧班建设发展规划 (2016-2020) - (CR Express development plan for 2016-2020), <http://www.ndrc.gov.cn/zcfb/zcfbghwb/201610/P020161017547345656182.pdf>

As far as the access to transport infrastructure and formal solutions are concerned, the present development of China-EU rail transport owes its significant dynamic mainly to the projects implemented prior to the announcement of the Belt and Road Initiative. From the point of view of long-term infrastructure projects, the announcement of China's initiative has happened quite recently. At present, the trade flows via the newly opened China-EU connections are executed using the easiest possible solutions, i.e. via the transport corridors that already have the biggest capacity, the best infrastructure and the most favourable legislative conditions. Due to their competitive advantage, **aside from a small number of test trains, all regular rail connections between China and the European Union have so far been carried out via the trans-Siberian routes that run through Russia.** However, the stakeholders of the Belt and Road Initiative, including both China and the states that wish to join the initiative, are making attempts to develop alternative transport corridors and, in the long-term perspective, redirect some of the trade flows to other routes.

Table 1. A comparison of transport corridors connecting the European Union and eastern China (Shanghai-Łódź)

Corridor	Trans-Siberian (A) (Manzhouli-Brest)	Trans-Kazakh (B) (Dostyk-Brest)	Trans-Caspian (Dostyk-Aktau-Baku-Poti-Charnomorsk)	Southern (Dostyk-Tehran-Ankara)	Maritime route (Gdańsk)
Distance (km)	11,430	9,910	12,120	12,430	20,810
No of border clearances	2	2	5	6	1
No of trans-shipment operations	2	2	6	2	2

Table 2. A comparison of competing transport corridors connecting the European Union with central China (Chengdu-Łódź)

Corridor	Trans-Siberian (Manzhouli-Brest)	Trans-Kazakh (Dostyk-Brest)	Trans-Caspian (Dostyk-Aktau-Baku-Poti-Charnomorsk)	Southern (Dostyk-Tehran-Istanbul)	Maritime route (Shanghai-Gdańsk)
Distance (km)	12,350	8,870	11,070	11,390	22,770
No of border clearances	2	2	5	6	1
No of trans-shipment operations	2	2	6	2	2

Source: Own calculations, searates.com

Map 2. China-EU rail transport corridors





1. The trans-Siberian corridors (via Russia)

Map 3. The trans-Siberian transport corridors connecting China and the EU



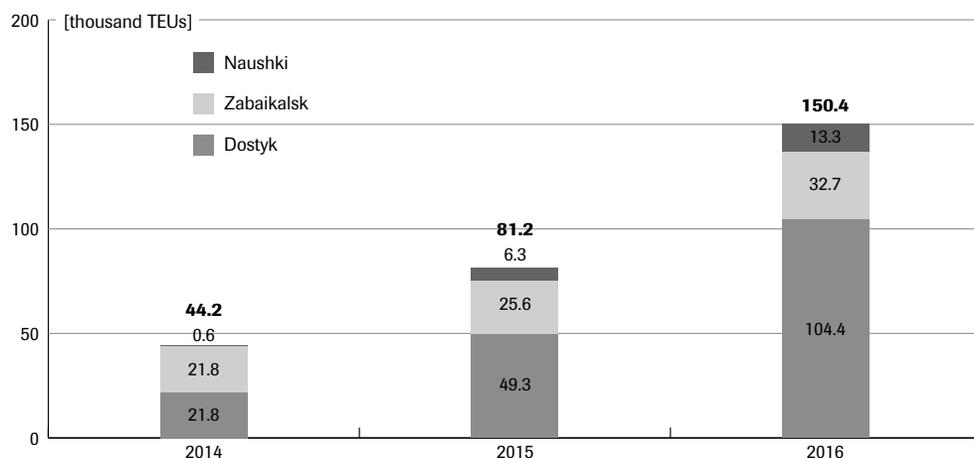


1.1. Utilisation to date

So far, the development of rail connections between China and the European Union has been based almost entirely on the three trans-Siberian corridors that run through Russia. At present, most containers are transported via the corridor that runs through Kazakhstan and starts on the Chinese-Kazakh border crossing of Alashankou/Dostyk. In 2014-2016, the number of containers transported via this corridor rose from 22,000 TEU to 104,000 TEU. In 2016, it accounted for 68% of the entire volume of China- EU-China transit via Russia. The second corridor uses the broad-gauge connection between the Chinese-Mongolian border crossing of Erenhot and the Chinese-Russian border crossing in Naushki. In 2016, 13,300 TEU of cargo was transported via this corridor. The oldest trans-Siberian corridor that starts in Zabaikalsk in the Russian Far East is ranked second in terms of the number of containers transported (32,700 TEU in 2016). However, in recent years it has recorded the slowest increase in cargo volumes²⁴. All three corridors meet in the Urals, near Yekaterinburg. From there, the goods are transported to the EU via Belarus and are transloaded onto standard gauge flatcars in Małaszewicze on the Polish-Belarusian border. For political reasons, at present transit volumes from Russia to the EU via Ukraine are very limited. A small number of trains have their terminus in the Baltic states (for example the Yiwu-Riga train).

²⁴ Back in the 1970s and 1980s, up to 15% of trade between Japan and Europe was transported by the trans-Siberian railway. Due to the chaos surrounding the collapse of the Soviet Union, the reduced pace of deliveries and their compromised security, the line was practically no longer used in transit. Attempts by Russian Railways to resume cargo transport by the trans-Siberian railway and to reform transport pricelists made it possible to increase the use of this route by China-EU rail connections.

Chart 2. China-EU rail transit (both directions) via Russia, in thousand TEUs, 2014-2016



Source: TransContainer

1.2. Hard infrastructure

The trans-Siberian corridors are characterised by the best infrastructure of all the routes discussed in this paper. Aside from selected sections – the Zaudinskiy-Naushki (253 km) section in the Mongolian corridor and the Monty-Dostyk (853 km) section in Kazakhstan – all rail routes are electrified double-track railways. In 2015, Russian Railways announced an investment of 50 billion roubles (US\$ 830 million) intended to expand the trans-Siberian corridors. The main problems in the development of the trans-Siberian corridors concern the rolling stock, for example the insufficient number of flatcars. Since 2009, a dry port with an estimated capacity of 600,000 TEU has been under construction in the vicinity of the new rail border crossing in Khorgos on the Chinese-Kazakh border. It is combined with a special economic zone intended for the logistics industry. Infrastructural deficiencies in Kazakhstan are being gradually made up for under local development strategies. In the longer term, the Polish-Belarusian border crossing of Terespol-Brest, which needs expansion and is at present servicing the entire traffic incoming from the trans-Siberian corridors, could be a potential bottleneck. The transit traffic capacity between China and the EU is estimated at around 300,000 TEU annually via the trans-Kazakh corridor and around 250,000 TEU annually by the trans-Siberian railway²⁵.

²⁵ E.Vinokurov, Transport Corridors of the Silk Road Economic Belt Across the Eurasian Economic Union: Preliminary Estimates for Transportation Capacity and Investment Needs; https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2771587

The bottleneck. The Małaszewicze trans-shipment terminal

The complete domination of the trans-Siberian corridors, combined with the elimination of transit via Ukraine, make the border crossings between Poland and Belarus points of key importance for EU-China rail connections. At present, nearly all of the trade flows are serviced on the Terespol-Brest border crossing that offers the most comprehensive trans-shipment facilities of all the border crossings on the EU border, enabling a shift from broad to standard track width. With current traffic intensity the border crossing's capacity (which is 14 pairs of trains per day on the Polish side) is already strained. This is causing numerous examples of congestion – frequently the trains incoming from China have to wait for up to several days for their cargo to be transloaded. The Belarusian side could help improve the situation, however its potential for action is limited due to insufficient infrastructure and the SMGS international agreement it is party to (it determines the exact location of cargo trans-shipment operations). Therefore, the modernisation of a portion of the railway and of the Małaszewicze terminal, planned in the upcoming years, is of key importance not only from the point of view of Poland and Belarus but also for the development of the system of EU-China rail connections as a whole. The excessively long duration of infrastructure modernisation and the absence of a correct sequence of works may lead to a temporary drop in China-EU rail traffic, and in the long-term perspective – to trade flows being redirected to other corridors and border crossings.

1.3. Soft infrastructure

The use of trans-Siberian corridors is facilitated by the thriving cooperation between the states of the Eurasian Economic Union, i.e. Russia, Kazakhstan and Belarus. In 2014, rail carriers from all three EEU founding states jointly established a holding known as the United Transportation and Logistics Company (UTLC) that groups the stakes held by local container operators. Its tasks include the unification of price lists, completion of the system of how containers circulate, joint preparation of carriage timetable, the unification of procedures. This leads to a reduction in the cost and duration of the trains' journeys. The question of EU-China transit has been given high political priority, as evidenced by a joint declaration regarding the setting of a minimum daily distance to be covered by a train at 1,000 km. This is tantamount to giving high priority to international transit trains, similar to that of passenger trains, in the congested Russian railway system. In 2012, the carriage price lists

on the Zabaikalsk-Brest route were reduced by 33% and in 2014 there was an 11% reduction of the fees for handling the containers on some of the routes. Evident tension between the EEU member states, which manifested itself in the reintroduction of border control on the border crossings between Russia and Belarus²⁶, seems not to have had any impact on the operation of the China-EU cargo trains to date.

1.4. Stakeholders

At the May 2017 summit of the Belt and Road Initiative in Beijing an agreement was signed by seven national carriers operating in the trans-Siberian corridor (China, Russia, Mongolia, Kazakhstan, Belarus, Poland, Germany) regarding efforts to improve carriage efficiency. This is proof of **Beijing's ambition to assume the role of coordinator in the expansion of the trans-Siberian corridors**. It is facilitated by the leading role Chinese companies have in the organisation of carriages. Other important stakeholders in the development of the trans-Siberian corridors include **Russian Railways (RZD)**, and also **Kazakh Railways (KTZ)** and **Belarusian Railways (BZD)** that cooperate with RZD. They have their own interests connected with the maintaining of their leading position in the China-EU container transport, and also re-directing trade flows to the logistics infrastructure that belongs to them. In politically-sensitive situations, such as the blockade of transit via Ukraine, RZD's actions are subordinated to the Kremlin's interests²⁷. Kazakhstan is another country that has been significantly involved in the development of the western corridor. Under its Nurly Zhol development strategy, it is gradually modernising its rail and logistics infrastructure, thereby increasing its attractiveness as a Central Asian logistics hub.

In the European section of the corridor, several EU states located in Central Europe, including Poland, Slovakia and Hungary, may benefit from offering transit and logistics services. The key role in shaping the system of carriages is played by **local national rail carriers** which most frequently act as parties in negotiations with foreign partners operating along the corridors.

²⁶ *Financial Times*, Belarus's Lukashenko slams Russia over border controls, <https://www.ft.com/content/4eeeb5ca-ea1f-11e6-893c-082c54a7f539?mhq5j=e6>

²⁷ TransContainer, a container operator controlled by Russian Railways (via UTLC), is renting a container terminal in the town of Dobra in Slovakia near the border with Ukraine, which is the final stop on a broad-gauge railway that ends in Slovakia. The decision to block transit via Ukraine has contributed to a reduction in the volume of goods transloaded at this terminal to less than 10,000 TEU.

Due to Russia's blockade of Ukrainian railways, at present almost all EU-China carriages pass through Belarus and Poland with the key point of the track gauge switch being the border crossing of Brest-Terespol. In 2017 transit through Ukraine was partially re-opened, with several test trains passing to Slovakia and Hungary²⁸. Trains passing through Ukraine could also possibly enter southern Poland.

The governments of Lithuania and Latvia are trying to attract a portion of transit flows incoming to the EU. To achieve this, they are developing a rail connection between the ports in Riga and Klaipėda, and China. Their major asset is their broad-gauge connection with the Russian railway network. Regardless of the fact that test connections to Western Europe have been launched (including the China-Riga-Rotterdam connection), the potential for taking over rail transit flows from China to Western Europe is very limited due to the high cost of transloading cargo onto ships. However, this could be a business niche in the sector of goods transportation to Scandinavia. Moreover, Lithuania intends to build a trans-shipment terminal on the Sestokai-Kaunas route to offer a switch from broad gauge to European standard gauge, that would be an alternative to the facilities in Małaszewicze. The possibilities of taking over major trade flows will be limited until Lithuania is connected with the European network via Rail Baltica.

As far as the development of the trans-Siberian corridors is concerned, Beijing's strategies are convergent with the interests of Russia and other states located along the route. From the point of view of the Chinese provinces that are currently subsidising the rail connections with the EU, currently the cheapest, fastest and safest trans-Siberian corridors also offer the best relation of costs to desired effects. **As a consequence, the trans-Siberian corridors have received the biggest support from the Chinese central government and are key elements in Chinese strategies.** Under the CR Express strategy, container flows incoming from China are to be directed to all three trans-Siberian corridors (with exports from specific Chinese provinces being assigned to each of them). It is noteworthy that the corridor running through Kazakhstan is mentioned in strategic documents drawn up under the Belt and Road

²⁸ Should the plan to extend the Slovak broad-gauge railway from Košice to Vienna be implemented, Austria could join the group of stakeholders interested in providing logistics services for the carriages. However, at present the future of this project is uncertain due to problems with its funding (in which Russia was to be involved) and the low chance of increased trade flows on this route.

Initiative as being one of key importance²⁹. As a consequence, Beijing's increased involvement in the expansion of these corridors, both in terms of hard and soft infrastructure, should be expected in the future.

1.5. The political context

From Beijing's point of view, the use of the routes that run through Russia is of major political significance, because in the long term it weakens Moscow's potential objection to the Chinese project of the Belt and Road Initiative. Observers point to the possible rivalry between the Chinese regional initiative and the Russian Eurasian Economic Union project. By using the routes that run through Russia, it creates a practical opportunity to combine the two initiatives and thereby avoid Russian-Chinese rivalry. In addition, in the Russian domestic political scene Russian Railways (RZD) increasingly often acts as a lobbyist in favour of close cooperation with China.

Alongside this, the dependence of all three trans-Siberian corridors on the Russian railway network enables Russia to use rail transport as a tool to exert political pressure on its neighbours. In 2016, following an order from the Russian government, RZD suspended its cooperation with Ukrainian railways and fully suspended rail transport between the two states. Although the intention to disrupt Ukraine's exports to Central Asia should be seen as Russia's primary goal, the railway blockade has successfully excluded Ukraine from participation in servicing China-EU container traffic. Similarly, Russia's actions have a negative impact on the prospects for balancing rail trade between China and those EU states that are covered by Russia's foodstuffs embargo. Although the wording of the Russian regulation excludes international rail transit from the sanctions regime, in fact Russian customs officers block the transport of some types of goods to China. This includes meat and fruit, which are viewed in the region as promising export goods. China, for its part, seems to tolerate Russia's actions in this respect.

The blockade of transit via Ukraine

The ongoing Russian-Ukrainian conflict is one of the factors shaping the development of the European section of EU-China rail connections. Starting

²⁹ In Chinese documents this corridor is referred to as Eurasian Landbridge. See Building the Belt and Road: Concept, Practice and China's Contribution, <https://eng.yidaiyilu.gov.cn/wcm.files/upload/CMSydylyw/201705/201705110537027.pdf>

from January 2016, a blockade of rail transit from Ukraine to Central Asia was introduced, following a decision by the Russian government. This move was mainly intended to disrupt Ukraine's exports. The tightening of the blockade by Russia and the retaliatory measures taken by Ukraine have brought a halt to rail transit from China to the EU via Ukraine. The reasons behind this were both practical (blockade) and business-related (increased risk and instability of supplies).

Starting from June 2017, test transit trains to the EU heading for Slovakia (Bratislava) and Hungary (Budapest) began to pass through Ukraine again. The governments of these states hope to benefit from the development of the connections via Ukraine. Slovakia intends to build a new logistics centre in Košice that would use the existing ŠRT broad-gauge railway from Užhorod to the US Steel steelworks. However, the potential for the development of transit via Ukraine is limited due to the country's domestic instability and political risks, including the conflict with Russia, as well as the low level of bilateral relations with China. Fears regarding the security of supplies may discourage the main clients, i.e. global companies, from opting for the transit of high value goods via Ukraine. As a consequence, the potential for the development of the trans-Siberian corridors is still largely dependent on the traffic capacity of the Małaszewicze trans-shipment terminal.

The blockade of transit via Ukraine has significant consequences for Central Europe. Most cargo flows are concentrated on the route that runs through Belarus and Poland. So far, the connections with the Czech Republic and Hungary (Yiwu-Budapest) have been carried out via the Polish border crossing in Terespol-Brest, instead of via Ukrainian-Slovak and Ukrainian-Hungarian rail border crossings (or the Polish border crossing in Medyka or the LHS broad-gauge railway). The exclusion of Ukraine from the development of overland rail connections between the EU and China is weakening the position of some Central European states including in their ability to benefit from transit and logistics services rendered for the connections.

2. The trans-Caspian corridors

Map 4. The trans-Caspian transport corridors connecting China and the EU





2.1. Utilisation to date

The trans-Caspian corridors form a potential alternative to the currently used rail transit routes from China to the EU. **However, the transport of goods via these corridors is much more complicated and requires complex inter-modal solutions.** The trains departing from China pass through Central Asian states and reach Caspian Sea ports (Aktau, Kuryk, Türkmenbaşy) where they are loaded onto ferries which take them to ports in Azerbaijan. Next, they are transported by rail to Georgia, from where the goods are transported by ferry to the European Black Sea ports. Next, they are sent to Central and Eastern Europe by rail or by road.

So far, the use of the trans-Caspian corridors in rail container trade with China has been insignificant and has been limited to the non-EU states located along this corridor. In 2015, on the initiative of Kazakhstan and Azerbaijan, in cooperation with a private operator, Mingsheng Logistics, an occasional train service known as the ‘Nomad Express’ was launched connecting Baku with Xinjiang. At that time, the government of Ukraine attempted to launch a train service with China that would bypass Russia. A Ukrainian test train launched in January 2016 departed from the port in Charnomorsk (called Ilichevsk at that time) and reached the Chinese-Kazakh border within 16 days. In the future, the train service is to operate regularly and the route is to be extended to EU member states: Lithuania, and also Poland – by a broad-gauge railway to the terminal in Sławków.

2.2. Hard infrastructure

The potential for using the trans-Caspian corridors is limited due to their poor transport infrastructure. Only half of the route is in a double-track standard, and major portions of it remain non-electrified. The route’s capacity is also limited by antiquated signalling systems as well as restrictions regarding train weight on certain sections of the route. The average train speed on this route is estimated at 40 km/h. Despite major investments carried out by Azerbaijan in the Kazakh port of Aktau and in Baku (the municipality of Alyat), the railway remains insufficiently suited to major container carriages. The insufficient number of ferries capable of transporting trains across the Caspian Sea is another problem. The fact that the route runs via two seas (the Caspian Sea and the Black Sea) increases the risk connected with bad weather, which is much smaller in the case of connections using overland routes only.

2.3. Soft infrastructure

The main problems affecting transit in the trans-Caspian corridor involve formalities including: border clearances, the absence of unified regulations and technical standards, and the volatility of transportation price lists. They are aggravated by the fact that six separate customs zones function along the corridor. A number of actors are involved in resolving the current problems and building an efficient intermodal transport corridor connecting China with the Black Sea states. One of the oldest initiatives that has served as the foundation for most of the other projects is the so-called Transport Corridor Europe-Caucasus-Asia (TRACECA), established in 1993 by the EU in cooperation with fourteen states of the region³⁰. At present, the EU's influence on the development of the corridor has been on the wane and that of the region's states has been rising. The cooperation under the Trans-Caspian International Transit Route (TITR), initiated in 2015 by Kazakhstan, Azerbaijan and Georgia, has been developing dynamically. Its direct aim is to introduce solutions that would facilitate container trade between China and the EU, and also China and Turkey. In 2016, rail transportation fees applicable on a section of the corridor were reduced by 50%, and taxes and transit fees have also fallen. These actions are intended to lower the cost of China-EU carriages sent via this corridor, to enable the creation of a genuinely competitive business alternative to the trans-Siberian corridors.

2.4. Stakeholders

So far, the corridors running through the Caspian Sea, the Caucasus and the Black Sea to the EU have not received any substantial support from the Chinese central government and the provinces. At present, Kazakhstan and Azerbaijan are the main stakeholders in the development of trans-Caspian corridors. They hope to draw economic benefits from the development of the logistics sector to facilitate container transit from China to Turkey and from expanding their own channels of trade with Europe and China³¹. The development

³⁰ Its participant states include: Armenia, Azerbaijan, Bulgaria, Georgia, Iran, Kazakhstan, Kyrgyzstan, Moldova, Romania, Tajikistan, Turkmenistan, Turkey, Ukraine, Uzbekistan. The goals of this comprehensive initiative include the development of rail connections. So far, 85 projects have been implemented as part of the initiative, worth a total of 187 million euros. Since 2009, which was when the initiative lost its funding from the EU budget, its dynamic on the EU side has visibly dwindled.

³¹ In the case of the route running through the Caucasus to Turkey, the Turkish government is another major stakeholder – see Chapter III.3.

of the trans-Caspian corridors has become a political priority for Ukraine. This is due to the blockade of rail transit via Russia, which is important for Ukrainian exporters operating in Central Asia³². Despite the EU's partial withdrawal from the development of the TRACECA corridor, some EU member states, including Romania and Poland, are involved in new initiatives. The emergence of major trade flows from China to Western European states via the trans-Caspian corridors may potentially boost competition between individual states in Central and Eastern Europe – mainly between the transit routes that run through Romania (Poti-Constanța), Poland (Poti-Chernomorsk-Sławków/Medyka)³³ and Slovakia (Poti-Chernomorsk-Dobra).

The future use of the trans-Caspian corridors for China-EU trade is uncertain due to Beijing's unclear stance on this matter. Although they were mentioned in the CR Express strategy as a potential route for goods transported from western China, at present China's involvement in the expansion of this corridor has been insignificant. No major actor associated with the Chinese central government is involved in the development of TITR and to date the project's business partner on the Chinese side has been a private company from Hong Kong. According to some Chinese rail operators and also European logistics companies, at present this corridor is too unpredictable and risky for them to be able to convince their clients to use it³⁴. This concerns in particular the transit via Ukraine, which the Chinese leadership and logistics industry representatives view as an unstable state characterised by an unfriendly business environment. The importance of transit via the Caspian Sea and the Black Sea could potentially increase when the subsidies are launched but, due to its relatively high cost, Chinese provinces do not see it as an attractive alternative.

2.5. The political context

The construction of the trans-Caspian corridors has clear political motives, including the intention to bypass Russia. These motives have been emphasised to varying degrees by individual stakeholders involved in the initiative. Representatives of Azerbaijan and Kazakhstan pointed to the need to reduce the political risk connected with the low level of predictability of Russian politics,

³² The 50% reduction of prices in Azerbaijan and Kazakhstan was possible as a result of Ukraine's efforts, among other things.

³³ The second route requires two additional border clearance procedures.

³⁴ Authors' talks with representatives of logistics sector in China and Central Europe, 2017.

the sanctions, and with the actions that destabilise the region³⁵. The corridor is being presented as complementing the current routes and as an alternative that guarantees the stability of supplies. Ukraine's actions intended to facilitate the development of the trans-Caspian routes are presented as an element of the trade war with Russia and as such are criticised by the Russian press. Similarly, the corridor's profitability is frequently challenged by some Russian experts³⁶. **The present calculations regarding increased use of the trans-Caspian corridors for China-EU transit are based on the assumption that there could be disruptions to the smooth flow of transit via Russia, including the potential destabilisation of states that are of key importance for the functioning of these corridors, i.e. Belarus and Kazakhstan**³⁷. There may be political reasons behind Beijing's insignificant involvement in the initiative; if China openly supported these more expensive corridors that bypass Russia and if it funded them, Moscow could interpret this as an unfriendly gesture.

³⁵ Kolejowy korytarz transkaspijski – alternatywa dla trasy przez Rosję' (The trans-Caspian rail corridor – an alternative to the Russian route), *Rynek Kolejowy*, 15.05.2017, <http://www.rynek-kolejowy.pl/wiadomosci/kolejowy-korytarz-transkaspijski--alternatywa-dla-trasy-przez-rosje-81692.html>

³⁶ Derailed: Ukrainian Silk Road Train Returns Home Empty, Sputnik News, 22.04.2016, <https://sputniknews.com/business/201604221038432755-ukraine-freight-train-empty/>; Dashed Hopes: 'No One Needs Ukraine's New Silk Road', Sputnik News, 02.04.2016, <https://sputniknews.com/europe/201604021037366206-ukraine-train-project/>

³⁷ If the problems regarding the infrastructure available in the trans-Caspian corridors remain unresolved, sea and air connections may regain importance should Russia block the route.

3. The southern corridors via Turkey

Map 5. The southern transport corridors connecting China and the EU





3.1. Utilisation so far

Another potential alternative route used in China-EU rail trade runs through Turkey. In this variant, the trains would travel partly along the trans-Caspian routes (on the China-Georgia section), and then use the Baku-Tbilisi-Kars rail connection and head for the European part of Turkey. In the long run, over-land-only connections are planned that will run via Central Asia and Iran. Before the railway link between Georgia and Turkey was opened in November 2017, a trains services – under the brand name Nomad Express – reached Turkey by ferry across the Black Sea or by trucks. According to representatives of Kazakh Railways, in 2016 three trains from China travelled via this route³⁸. According to TITR (which is involved in developing the connections with Turkey, among other things), the volume of trade flows that passed through this route in 2017 is estimated at around 5,000 TEU³⁹. In plans adopted by the states involved in the construction of this corridor, the volume of rail container trade between China and Turkey (including transit) is expected to rise to 300,000 TEU annually by 2020.

3.2. Hard infrastructure

Despite the modernisation of the Baku-Tbilisi-Kars railway, **the main limitation of southern corridors is the condition of rail infrastructure in Turkey.** It includes numerous sections that have only one set of tracks and the average daily distance covered by a cargo train is around 400 km (on the routes that run via Russia it is around 1,000 km)⁴⁰. Another problem involves the insufficient availability of ferries on the Caspian Sea. Should transit be extended to the EU, the Bosphorus could be a potential bottleneck – cargo trains would need to cross it by ferry. The situation may change when the last stage of construction of the Marmaray undersea railway tunnel in Istanbul is finished, which is expected at the end of 2018. However, the launch of the project has repeatedly been postponed and the tunnel's capacity for cargo transport will be limited due to large passenger flows.

³⁸ Over 50 trains will pass Azerbaijan via TITR project in 2016, Azernews, 3.07.2017, <https://www.azernews.az/business/97543.html>

³⁹ TRACECA Logistics Processes and Motorways of the Sea II, LOGMOS Master Plan – Annex 9.1, http://www.traceca-org.org/fileadmin/fm-dam/TAREP/65ta/Master_Plan/MPA9.1KZ.pdf

⁴⁰ O.F. Uysal, The Iron Silk Road: How will Turkey be Involved?, Caucasus International, http://www.elibrary.az/docs/JURNAL/jrn2016_540.pdf

3.3. Soft infrastructure

Due to the partial overlap of southern corridors with the trans-Caspian corridors, most actions aimed at facilitating the transport from China via Turkey are carried out in existing forums, including TITR (where Turkey cooperates with Azerbaijan and Kazakhstan), and under the European TRACECA initiative. Over the last several years, the government of Turkey has been implementing a programme known as the Caravan Project. Projects carried out under the programme and meetings of representatives of the states of the Caucasus and Central Asia are mainly intended to harmonise trade and customs regulations in that region. In Turkey alone since 2016, reforms to liberalise the railway market have been implemented that could potentially help facilitate the traffic on China-EU transit connections.

3.4. Stakeholders

From China's perspective, the present work on the development of the southern corridor has mainly been focused on establishing a permanent train service with Turkey. At present, using this corridor to offer a regular train service to the EU is not an attractive option either for Beijing or for the individual provinces⁴¹. In the long-term, this route has been mentioned in the CR Express strategy as a future potential alternative route to the EU.

Aside from China, Turkey is the main stakeholder in the southern corridor – the development of rail connections with China is an element of the plans to develop intermodal corridors in Turkey. Turkey's interests are convergent with the interests of Kazakhstan, Georgia and Azerbaijan (which will be using the option of transit via the Caucasus). Similarly to the trans-Caspian corridors, the connections via Turkey are viewed by some Turkish experts as a potential route for transporting goods from China to the EU which bypasses Russia⁴². However, this route is much longer than the trans-Siberian corridors.

⁴¹ Interviews with representatives of Chinese regional governments and the logistics sector, August-September 2017.

⁴² Rail Turkey, Can Turkey replace Russia in China-Europe rail traffic?, 8 December 2016, <https://railturkey.org/2015/12/08/can-turkey-replace-russia-in-china-europe-rail-traffic/>

3.5. The political context

So far, the economic cooperation of the states located along the route that leads to Turkey has shown that pragmatic collaboration focused on the improvement of transport corridors is possible. The instability of the governments of Central Asian states (including Kazakhstan) and the potentially destabilising actions of the Kurdistan Workers' Party (PKK) in eastern Turkey generate political risk.

The routes via Iran

In the CR Express strategic document published in 2015, the route that runs from China via Central Asia, Iran and Turkey was mentioned as another corridor that could potentially connect China with Europe. Only a few test trains connecting China and Iran have been launched in this corridor (for example on the Yiwu-Tehran and Chengdu-Tehran routes). So far, China has been interested in servicing trade with Iran and not in performing transit operations to the EU. So far, Turkey has not shown a major interest in developing this type of connections either⁴³, although this may form a potential field for a pragmatic cooperation with Iran. Tehran's transport policy includes plans to develop alternative transport corridors to Europe that would run through the Black Sea, which is partially convergent with the plans adopted by China. Although unlike the trans-Caspian corridors, this route does not require the use of ferries, it has several drawbacks including poor infrastructure and the political instability of the areas through which the trains would be passing. If it is to be used more extensively, the insufficient railway infrastructure in Uzbekistan and Kyrgyzstan would have to be improved.

⁴³ O.F. Uysal, The Iron Silk Road: How will Turkey be Involved?, Caucasus International, http://www.elibrary.az/docs/JURNAL/jrn2016_540.pdf

4. A separate sea-land route – the Balkan corridors

Map 6. China-EU sea-land Balcan transport corridors





4.1. Utilisation to date

The role of Central and Eastern Europe in the development of the Belt and Road Initiative is not limited to rail-only corridors. **China is also interested in the development of the so-called Land-Sea Express Route (*zhongou luhai kuaixian*) which is a maritime route from Chinese ports to the Greek port of Piraeus, from which the goods are then transported to Central and Western Europe by rail.** This makes it possible to reduce the traditional maritime route from China to the EU (that runs from the Suez Canal, via the Strait of Gibraltar to the ports on the North Sea and the Baltic Sea) by around 4,500 km. The use of the port in Piraeus and the corridor that runs via the Balkans reduces the total duration of maritime transport from China to the EU border by around 8-12 days⁴⁴. Therefore, this corridor is not a direct alternative to the overland rail corridors (as regards the scope in which these compete with each other). It is rather a section of the maritime 'Road' and not of the overland 'Belt' discussed above. At present, from Piraeus the goods may be transported to Central Europe using two corridors - via Bulgaria and Romania (the so-called TEN-T IV corridor) or via Macedonia and Serbia (the so-called Corridor X).

China's biggest shipping company COSCO Shipping's 2009 purchase of the container terminal in Piraeus, followed by the company gaining control of the entire port in 2016 triggered the development of these corridors. Having built the missing connection between the terminal and the Greek railway network, in 2013 COSCO and the Greek railway carrier TrainOSE began to offer block-train services to Central Europe to multinational companies that had established their logistics centres in Piraeus. These companies include: Hewlett-Packard, Foxconn, Hyundai and Sony⁴⁵. The goods are delivered to manufacturing plants in: the Czech Republic (Pardubice), Slovakia (Bratislava) and Hungary (Győr). In 2015 around 500 trains (carrying around 30,000 TEU)⁴⁶ travelled on this route. In 2017, COSCO launched two test train services on the Piraeus-Budapest route that carried various Chinese products, including

⁴⁴ The ultimate amount of time saved will depend on the distance of specific destinations from the port in Piraeus, which means that this form of transport is the most favourable for Balkan and Central European locations.

⁴⁵ Before 2013, the container terminal in Piraeus had not been connected to the Greek railway system.

⁴⁶ Potenciál pro rozvoj kombinované dopravy v Řecku [The potential for the development of intermodal transport in Greece], http://www.mzv.cz/athens/cz/obchod_a_ekonomika/obchodne_ekonomicke_aktuality/potencial_pro_rozvoj_kombinovane_dopravy.html

furniture⁴⁷. Currently COSCO launches about 8 freight trains from Piraeus to Central and Eastern Europe a week (this is equal to 35,000 TEU a year)⁴⁸. Similar services are offered in the port in Piraeus by other major international forwarding companies, including the German company DHL. In 2016, around 200,000 TEU⁴⁹ were trans-shipped in Piraeus, intended for further transit. A quarter of them is later transported to mainland Europe by rail⁵⁰. Due to the absence of statistics, the present use of specific rail routes is difficult to estimate.

4.2. Hard infrastructure

Due to the present infrastructure limitations, rail transport via the corridors discussed above has not yet reached its full potential. Most of the rail sections of the corridor that runs through Romania and Bulgaria is a single-track railway and the maximum speed a train can reach travelling on this route is 60-70 km/h. At present, the duration of a train's travel on the route from Thessaloniki to Budapest is around 26 hours. The corridor has been entered onto the list of core corridors under the European TENT-T network, which has opened the way to more extensive financing of infrastructure modernisation from EU funds. At present, modernisation is ongoing in Romania (a 490 km section costing 2.9 billion euros) and Bulgaria (1.6 billion euros). The travel time is to be reduced to 14 hours by 2020.

The rail route that runs from Piraeus to Budapest via Serbia and Macedonia (Corridor X) is around 300 km shorter but it offers poorer infrastructure. The average train speed in this corridor is around 35 km/h and the average duration of travel from Thessaloniki to Budapest is 49 hours. According to the plans adopted by the government of Serbia (85% of this route runs through Serbian territory), in the upcoming decade investments to facilitate the corridor's development costing around 2 billion euros will be carried out and the

⁴⁷ Xinhua, 中欧陆海快式联运正式开通 (The sea-land connection with Europe has been officially launched), 2 July 2017, http://news.xinhuanet.com/2017-02/07/c_129470373.htm

⁴⁸ Author's conversation with a representative of COSCO Shipping, November 2017.

⁴⁹ The basic field of operation of the port in Piraeus is the transloading of containers from bigger container ships onto smaller ones (referred to as feeders) that deliver Asian goods to less prominent European ports. Since the Chinese company COSCO acquired the port, the volume of transloaded goods has increased from around 400,000 TEU in 2008 to more than 3 million TEU in 2014.

⁵⁰ A. Bauranov, The Port of Piraeus – Opportunity for Railways in South East Europe?, <https://www.globalrailwayreview.com/news/29672/port-piraeus-railways-south-east-europe/>

cruising speed will be 80-100 km/h. Russian Railways (RZD) are involved in the modernisation of the selected sections of Corridor X in Serbia, and the project is funded as part of the US\$ 800 million credit line offered to Serbia by Russia⁵¹. In 2014, memorandums worth 2.9 billion euros were signed by China, Serbia and Hungary regarding the modernisation of a section of the rail route connecting Belgrade with Budapest⁵². There are doubts to whether the project will be implemented by the Hungarian side due to legal controversies (including non-compliance of the tender procedure with EU law); the European Commission has launched an investigation procedure on this matter⁵³.

4.3. Soft infrastructure

The poor quality of ‘soft’ infrastructure is the basic limitation preventing the use of the corridors that run through the Balkans, in particular in the context of their potential competition with the ports in northern Europe. Other problems that need resolving include: the need to devise proper transit procedures, to simplify customs clearance procedures and to expand the cooperation of rail carriers and logistics companies operating in the states located along the corridor. For the Thessaloniki-Budapest route, the average waiting time at border crossings in Corridor IV is around 8 hours (30% of total travel time). For Corridor X it is as long as 25 hours (more than half of total travel time). The unpredictability of delivery schedules, with differences of up to several hours, remains a major challenge for the development of transport in this corridor.

4.4. Stakeholders

The emergence of China as a new actor in the development of rail transport corridors that run through the Balkans has significantly increased the importance of Corridor X that runs through Macedonia, Serbia and Hungary. From Serbia’s perspective, the development of this corridor is convergent with the strategy of expanding the local railway network intended mainly for cargo traffic. The government in Belgrade is also trying to build up Serbia’s position as the key transit state in the region. For both Serbia and Hungary,

⁵¹ Russia to finance Serbian rail investment, 4 June 2013, <http://www.railjournal.com/index.php/europe/russia-to-finance-serbian-rail-investment.html>

⁵² The project is funded by Chinese banks.

⁵³ *Financial Times*, EU sets collision course with China over ‘Silk Road’ rail project, 20 February 2017, <https://www.ft.com/content/003bad14-f52f-11e6-95ee-f14e55513608?mhq5j=e6>

the expansion of infrastructure in Corridor X is an important element of their bilateral relations with China.

On the Chinese side, the main stakeholder involved in corridor development is COSCO, which is actively supporting the development of trade flow on this route, including by expanding the port in Piraeus and developing its cooperation with the global producers of electronic devices. As far as infrastructure construction is concerned, China Railway is active in Corridor X and is responsible for the modernisation of the railway connecting Belgrade and Budapest. These actions have received political support from the Chinese government. For example, a Hungarian-Serbian-Macedonian taskforce to simplify customs clearance procedures has been established under the '16+1' cooperation format. So far, China's actions in Corridor IV, which in EU strategies continues to be a priority, have been insignificant. However, this does not rule out the possibility that COSCO will use this corridor in its operations.

The development of the land-sea route via the Balkans should be viewed as a method China applies to increase its share in maritime container freight between China and the EU. China's actions intended to redirect a portion of trade flows to Piraeus may meet with resistance on the part of northern European ports and the states where they are located⁵⁴. In Central and Eastern Europe, the development of this corridor may potentially threaten the Baltic ports, for example in offering services to companies from Central Europe. Corridor development is also impacted by actions carried out by the alliance of the two largest originally European shipping companies: Maersk and MSC. The latter has decided to move its operations from Piraeus to Turkey, which contributed to a major drop in the number of containers which Chinese companies trans-shipped in Piraeus.

4.5. The political context

China's involvement in the expansion of transport corridors that run via the Balkans has sparked major controversy in the EU. This mainly concerns the modernisation of the Hungarian section of the Budapest-Belgrade rail connection funded by China. It is also being viewed as a key element of China's expansion in Central and Eastern Europe. According to representatives of EU

⁵⁴ F.-P. van der Putten (ed.), *The Geopolitical Relevance of Piraeus and China's New Silk Road for Southeast Europe and Turkey*, https://www.clingendael.org/sites/default/files/pdfs/Report_the%20geopolitical_relevance_of_Piraeus_and_China's_New_Silk_Road.pdf

institutions, as well as experts from some European states (Germany in particular) China's actions are intended to build political influence in the region that subsequently could be used to break up the unity of the EU's policy towards China. Doubts are also being raised regarding the model of financing offered by China, including its transparency and consequences in the context of debt increase. Due to the fact that Beijing has given clear political priority to the modernisation of the Belgrade-Budapest railway (which is being presented as one of the first achievements of the Belt and Road Initiative itself), this may cause political tension that could affect the development of Corridor X.

Rail transport via the Balkans could also potentially be disturbed should the migrant crisis worsen. In 2015, as a result of the railway on the Greek-Macedonian border being blocked by migrants who had used the Balkan route to reach Europe, around fifteen trains transporting goods from Greece were stopped for several days. Actions intended to make EU borders less porous also contribute to further delays during border clearance procedures – this is happening for example on the border crossing between Serbia and Hungary, where trains are X-rayed for individuals trying to cross the border illegally.

IV. THE ECONOMIC POTENTIAL OF THE CHINA-EU RAIL CONNECTION

Most forecasts assume that only a few per cent of the total volume of goods sent from Asia to Europe can be transported by rail⁵⁵. Indeed, rail is not necessarily a suitable means of transporting raw materials and unprocessed metals from China to Europe. However, it is not the weight of the transported goods that matters the most for the connection as a whole. The connection could be an important means of transportation for technologically advanced products such as electronic devices, advanced components and specialist machines. These products are not large and frequently their main asset is their high value. Therefore, it is likely that small amounts of very important goods will be transported by rail, which may help China gain a competitive advantage over its Asian competitors in the sector of the logistics of goods sent to Europe. Moreover, it will be a chance for Europe to strengthen its position in the Chinese market, in particular in the sector of luxury products and premium food.

From the historical point of view, the present development of the rail connection between Asia and Europe is not a new phenomenon. The 1970s saw a dynamic development of the rail transportation of goods via Siberia; most of these goods were transported on to Europe. In 1980, the volume of transported goods was 110,000 TEU⁵⁶. Goods transported from Japan rather than to Japan made up a major portion of this volume⁵⁷. Until 1979, 20% of Japan's exports to Europe was transported by rail⁵⁸. Similar estimates are cited by other authors who claim that, back in the 1980s, around 11% of trade between Asia and Europe

⁵⁵ The authors of the Retrack report have arrived at more optimistic conclusions. According to them, in 2010 the rail route via Siberia could have potentially accounted for the transport of 1.43% of goods traded between the EU27 and China. The forecast for 2020 is even more optimistic. It suggests that 9.24% of goods in EU27-China trade could potentially be transported via Siberia by rail. According to the authors of the Retrack report, in 2020 18.5% could be transported by rail from Asia to Europe and *vice versa* provided that the transportation price is reduced by 50% compared with 2010 and that the duration of travel is reduced by 25-30%. See: Potential for Eurasia land bridge corridors & logistics developments along the corridors p. 176-177. https://www.tno.nl/media/2825/report_potential_eurasia_land_bridge_rail-corridors_final_25042012.pdf

⁵⁶ A. Liliopoulou, M. Roe, I. Pasukeviciute, *Trans Siberian Railway: from inception to transition, European transport*, No. 29(2005), 2005, p. 51.

⁵⁷ L. Myles, L. C. Robertson, *Soviet Policy Towards Japan: An Analysis of Trends in the 1970s and 1980s*, Cambridge University Press, 1988, p. 57.

⁵⁸ A. Liliopoulou, M. Roe, I. Pasukeviciute, *Trans Siberian Railway: from inception to transition, European transport*, No 29(2005), 2005, p. 51.

was transported by rail⁵⁹. The reasons behind such a rapid development of the rail connection included the speed of transportation and the low transit fees charged by Soviet railways. The collapse of the USSR, combined with a drop in maritime transport prices, contributed to a major decrease in the use of the rail connection recorded in the 1990s.

1. Trade exchange – the strengths and weaknesses of rail transport

Rail connections between China and Europe are a niche solution suited to selected categories of goods and business models. They are in the middle of the scale between inexpensive and slow maritime transport and costly and fast air freight⁶⁰. On almost all of the routes discussed above, goods can be transported from Asia to Europe by rail twice as fast as maritime transport and twice as slow as air transport. The time it takes to transport goods from one terminal to another by air is 5-9 days, by rail 15-19 days and by sea 37-50 days⁶¹. Similarly, rail transport is more expensive than maritime transport and cheaper than air transport. In the present market situation, including in particular the exceptionally low cost of maritime transport, rail freight costs nearly twice as much as sea freight and is many times cheaper than air freight. **When deciding on goods logistics, companies do not merely take into account the price and duration of transport. Every time rail transport is chosen, a number of business factors are taken into account: the geographical location of the goods, their value, their vulnerability to damage, their size. Other important issues include the safety and promptness of delivery and the impact on the environment.**

⁵⁹ Z. Farkas, A. Pap, N., Reményi, Hungary's place on Eurasian rail land bridges and the eastern opening, *Hungarian Geographical Bulletin*, 65 (2016) p. 8.

⁶⁰ There is another, less frequently-used combined air-sea mode of transportation. It involves the sea freight of goods from China to Dubai, followed by air transport to Europe. The duration of transport in this case is comparable to rail transport, however, it is much more expensive.

⁶¹ E. Gerden, China may heavily subsidize container rail shipments to Russia, https://www.joc.com/rail-intermodal/international-rail/asia/china-may-heavily-subsidize-container-rail-shipments-russia_20160129.html

Table 3. A comparison of the shipping cost and time for goods transported between China and Europe

Shanghai-Gdynia	Plane*	Train	Ship
Price (US\$/container)	37,000	4,500	2,600
Duration (days)	5-9	19	37-42
Chengdu-Warsaw	Plane	Train	Ship
Price (US\$/container)	37,000	5,000	4,500
Duration (days)	5-9	15	43-50
Shanghai-Rotterdam	Plane	Train	Ship
Price (US\$/container)	37,000	5,000	2,200
Duration (days)	5-9	18	27-37

*The air transport price is only an estimate.

Source: Own calculations based on data published on the website <https://www.searates.com> on 3 October 2017

Rail transport is more attractive than maritime transport for places located at a greater distance from sea ports. One example of this are rail connections from central and western China to Central and Eastern Europe. Here the price is frequently similar to the price of maritime transport⁶². Transporting goods to ports and collecting them from ports, frequently by road, is a costly solution. Transportation inside China is quite costly due to various bureaucratic requirements regarding cargo traffic between provinces⁶³. In the case of rail transport, usually there is no need to use long-distance road transport because many cargo terminals are available, both in China and in Europe. For the same reason, rail transport is more attractive than maritime transport, when the duration of load consolidation and deconsolidation is taken into account. Many ships are able to take more than fifty thousand containers onboard and load-

⁶² At present, this is mainly due to subsidies being offered. The cost of transporting one container from western China to Europe is estimated at around US\$ 6,000-7,000.

⁶³ Frequently, in their manufacturing plants, foreign automotive companies manufacture cars intended for a specific province. They argue that it is more cost-effective to produce fewer cars and locate manufacturing plants in the vicinity of the target market than to bear high costs of goods logistics.

ing and unloading them is a logistically complex and time-intensive task. This is why the duration of goods delivery in the door-to-door mode may be considerably different than the time needed to deliver goods from one terminal to another. For rail transport, these differences are considerably smaller.

In many industries the pace of market changes is so fast that companies may be ready to pay more for transporting their products than what they pay for maritime transport, just to win some time. Rail can also be an attractive solution for transporting products that have so far been transported by air – provided that the slightly longer delivery time is acceptable. Transport by train is cost-effective mainly in the case of goods that require major capital investments as well as goods with a high profit margin. The higher the value of the transported goods per container, the less important the transportation cost is for the final product price. According to UN reports, categories of goods that may be transported by rail in a cost-effective manner (taking into account the duration of transportation and high product value) include: pharmaceutical products, electronic devices, IT products, fashion items, shoes, automotive components, tyres, selected construction elements, wood, chemical products, fertilisers, household items, pipes, selected machines and some categories of agricultural produce⁶⁴. In a foreseeable future, it will not be cost-effective to transport goods by rail that are rather inexpensive and large-sized, for example: construction materials, petroleum derivatives and liquefied gas. Rail also enables the introduction of innovations to improve the standard of transporting goods. One example of this is the introduction of containers in which items of clothing can be transported hanging, to preserve their shape.

According to analyses prepared by DHL, at present rail freight is the most popular with manufacturers of automotive products and capital-intensive goods such as machines. Rail transport is slightly less frequently chosen by companies from the high-tech, electronics, computer and FMCG (fast-moving consumer goods) sectors. Manufacturers of chemical products, spare parts, household items and medicines are less inclined to opt for rail transport and companies from the fashion and food processing industries are only occasionally interested in this mode of transportation.

⁶⁴ Report Identification of cargo flows on the Euro-Asian transport links, 2016, <http://www.unece.org/fileadmin/DAM/trans/doc/2016/sc2/ECE-TRANS-SC2-2016-id02e.pdf>, pp. 62–63.

Expected savings on capital are an important criterion when choosing rail transport for products. The maritime transport of high value goods requires some capital to be frozen for several weeks and generates major costs for companies, in particular those using external funding. This factor is also important for capital-rich companies, because when capital is frozen, they are unable to use it for other purposes.

Table 4. A comparison of the cost of transporting one container of goods worth US\$ 1 million by rail and by sea, taking into account the costs of capital freezing

The value of goods in the container	US\$ 1,000,000	
Mode of transportation from China to Europe	By rail	By sea
Loan interest rate	6%	6%
Duration of transportation (days)	20	50
Carriage price (US\$)	5,000	2,000
Cost of capital use 6% (US\$)	3,288	8,219
Price of carriage and capital use (US\$) 6%	8,288	10,219
Cost of capital use 8% (US\$)	4,384	10,591
Price of carriage and capital use (US\$) 8%	9,384	12,591

Source: Own calculations

Table 4 shows a comparison of the cost of carriage of one container by sea versus by rail from China to Europe taking account of the cost of capital freezing⁶⁵. It has been assumed that the container contains goods worth US\$ 1 million, which suggests that these are goods of medium to high value, for example electronic devices. When premium electronic devices are transported, the value of one container can be as much as US\$ 10 million. Another assumption was that the annual cost of lending capital is 6%, which is a standard market rate, taking present interest rates into account. This calculation suggests that the cost of lend-

⁶⁵ The importance of the cost of capital in the strategies of individual companies is confirmed by the successful implementation of production organisation processes in the automotive sector, which involved the use of the 'just-in-time' model. This model's primary goal is to limit the need to store car parts and for subassemblies to the necessary minimum. This is one of the reasons why the rail connection is popular with major suppliers to automotive companies.

ing capital to fund the goods alone is US\$ 3,288 for one train which travels for 20 days, and US\$ 8,219 if the goods are to be transported by ship, which takes 50 days. If these costs are included in the price of the train service, it turns out that in the case of goods of medium to high value, the saving made when choosing rail transport from Europe to Asia is US\$ 1,931. This suggests that rail transport is cheaper than maritime transport if the container value is at least US\$ 0.61 million. The importance of the argument regarding the cost of capital will likely rise when the global cycle of central banks raising their respective interest rates begins. If interest rates are raised by 2 percentage points from the present record low to 8%, the cost of using capital for rail transport of goods worth US\$ 1 million will increase from US\$ 3,288 to US\$ 4,384, and the cost of transporting them by sea will increase from US\$ 8,219 to US\$ 10,959. The transportation savings will increase by 42% from US\$ 1,931 to US\$ 2,740.

Another manner of using rail transport is to transport goods that require fast delivery. These include promotional fashion items, as well as products delivered in connection with customer complaints or a failure. In these situations, time is of key importance, because the company's production or sales plans must not be disturbed. It sometimes happens that companies receive faulty subassemblies from their Chinese subcontractors and request replacements to be dispatched by rail as quickly as possible, so that their production cycle is not interrupted. In these circumstances, maritime transport lasts too long and air transport is relatively expensive.

One example of the creative use of rail transport involves the lease of specialist systems and machines. There are situations in which a company needs to lease a machine in Europe to carry out its investment in China, for example when it intends to relocate its manufacturing plant. In this situation, the rail transportation of this machine can be a suitable solution due to the reduced duration of the machine's transport to China and back by as much as a month. This generates tangible savings on the cost of leasing the machine. **Similarly, rail transport is potentially favourable for large-sized products and goods that are vulnerable to damage.** Transporting large and non-standard-sized goods by ship is very costly due to the fact that these goods need to be properly positioned onboard the ship. Frequently, the air transport of such goods is not possible at all. The problem in particular affects the machine building industry and the factory equipment sector, as this equipment is sometimes bigger than the container which is supposed to transport it. For rail operators, transporting such goods is a much easier challenge, which is why this type of service can be cheaper not only than air transport but also than sea transport. From

this perspective, rail transport may contribute to greater competition between European producers and their Chinese counterparts. For example, Chinese companies operating in the turbine sector had problems entering the European market because their products are heavy and difficult to transport.

Rail transport generates a smaller risk that the goods may get damaged, lost and contaminated by sea water. Ocean freight is exposed to weather-related risk including the risk of containers falling overboard.

Temporary problems on the sea freight market are favourable for the rail transport market. In recent years, delivery by sea was becoming increasingly slower for example due to congestion during the loading and unloading of goods in the ports, as well as to limitations of ship speed due to so-called 'slow steaming' to save fuel⁶⁶. The introduction of this system has caused an increase in the duration of maritime transport of goods between Chinese and Western European ports from 28 days to 35 days⁶⁷. **Recently, the viability of maritime freight has been additionally challenged by major price fluctuations.** The collapse of Hanjin, a Korean container operator, has caused major shifts in market alliances formed by the largest shipping companies, as well as temporary problems with goods transportation, which turned out to be favourable for rail transport⁶⁸. In addition to this, in recent years maritime transport has been characterised by major price fluctuations, which prevented companies from making long-term plans regarding the cost of freight. The difference in the maritime transportation price due to price fluctuations can be up to US\$ 1,000 per container over a year, which means that the rate charged for transporting one container may even double over the course of a year. There are numerous indications that recent shifts in maritime transport alliances are not the final stage of this sector's restructuring. This is particularly important in the context of the sector's problems with maintaining profitability even in a favourable market situation when oil prices are low⁶⁹.

However, there are several structural factors that, at least in the medium-term perspective, speak in favour of the better cost-effectiveness

⁶⁶ M. Bolle, A. Kortsarl, Europe – Asia Railway Transport: Issues & Prospects, p. 11.

⁶⁷ Report Identification of cargo flows on the Euro-Asian transport links, 2016, <http://www.unece.org/fileadmin/DAM/trans/doc/2016/sc2/ECE-TRANS-SC2-2016-id02e.pdf>, p. 47.

⁶⁸ I. Putzger, On the rails: Growth in Asia's slower lane, 9.02.2017, <http://aircargoworld.com/allposts/on-the-rails-growth-in-asias-slower-lane/>

⁶⁹ China's dominance in intra-Asia trade troubles carriers, 1 June 2017, https://www.joc.com/maritime-news/trade-lanes/intra-asia/chinas-dominance-intra-asia-trade-troubles-carriers_20170101.html

of maritime transport compared with rail transport. These include the economies of scale due to the large volumes of the transported goods, the flexibility of the price list policy, the use of the slow steaming sailing mode and the existence of ship-owner alliances⁷⁰. The global economic crisis has slowed down the pace of development of global trade and resulted in a reduced pace of the increase in demand for new transportation opportunities. It has also strongly contributed to the unblocking of Chinese ports which had had increasing problems with the efficient trans-shipment of goods. A weaker demand for transportation has caused a crisis in the maritime transport sector, as a result of which some shipping companies became insolvent. It also created a certain pressure to reduce the price of transporting goods by sea. Moreover, any rail connection needs to develop on an ongoing basis to meet the basic market requirements such as: the regularity of the train service, promptness of delivery, the flexibility of carriage price lists depending on the current market situation, and the availability of added value services combined with the transportation services⁷¹.

It is not known for how long cargo rail transport will continue to be subsidised by the Chinese government. This generates a certain level of political risk and may discourage some potential investors from investing major funds in logistics infrastructure. On the one hand, in its various documents the government in Beijing has announced that within a couple of years it would like to launch the process of limiting the scope of subsidies. Attempts of this type have already been made, but they met with strong resistance on the part of the provinces. According to some of our interviewees, the ultimate goal of the Chinese leadership is to gradually reduce the tariffs by 20% annually over a period of several years. However, it seems that the present scale of China's political involvement in the rail connection initiative will guarantee a stable level of the subsidies offered to rail transport for at least the next several years.

Rail has not yet reached its optimum potential as regards the duration of transport between Asia and Europe. According to the World Bank, the trans-Siberian routes still have major potential for making improvements that could reduce the duration of train travel. These improvements include the creation of alliances of international forwarding companies to coordinate the transport of goods between China and Europe, performing the loading of goods in a smaller number of bigger terminals, and the introduction of non-stop goods tracking

⁷⁰ Identification of cargo flows on the Euro-Asian transport links, Eurasian Rail Transport Conference, United Nations Economic Commission for Europe, p. 10.

⁷¹ *Ibid.*

systems and information exchange, which in turn could facilitate customs controls⁷². Efficient cooperation between the states through which a specific train travels remains an issue of key importance for the development of the connections. The introduction of common procedure standards may not only reduce the bureaucratic costs, but also increase the predictability of delivery. In all the states located along a specific route, rail carriers are at pains to give priority to trains travelling from China to Europe and *vice versa*. Frequently, this happens on border crossings as well. Attempts are being made to introduce common customs clearance and carriage procedures. Within a couple of years this may lead to the adoption of improved procedures to increase the predictability of the delivery of goods dispatched by rail⁷³. However, in this case success depends on how advanced the political cooperation between specific actors along the Route will be.

The advantage of air and sea transport over rail transport is that, in the case of the former two options, the goods do not need to undergo customs checks other than at their entry and exit points. This means that the delivery of goods dispatched by air and by sea is usually more prompt. Trains reach their terminus 1-2 days before or after their expected arrival time, whereas for ships and planes the time window is several hours. A train needs to undergo several customs checks which not only prolong the duration of transportation but also generate the risk that delivery may be delayed or goods may be returned to their sender should the waybills be wrongly filled in. From the perspective of logistics terminals, the promptness of goods delivery is extremely important because they usually prepare precise hourly schedules for their logistics operations. **This is why the problem involving the predictability of delivery is one potential barrier to the development of rail connections between Asia and Europe.** At present, what matters more for the customers is a guaranteed delivery time rather than a reduction in the duration of transportation by several days. From the perspective of multinational companies, this alone can make rail freight a reliable means of transportation. However, transporting goods by rail is favourable also due to the greater flexibility of customs procedures. Especially in China, goods dispatched by sea undergo customs clearance in their exit ports, whereas when they are transported by rail, these procedures

⁷² C. Rastogi, J. Arvis, *The Eurasian Connection Supply-Chain Efficiency along the Modern Silk Route through Central Asia*, World Bank, Washington 2014, p. 7.

⁷³ One of the problems is the fact that it is difficult to determine the train's journey time and the exact time of its arrival in the end terminal, especially since the states of Central Asia are characterised by their low level of supply chain reliability when it comes to delivery promptness. See. C. Rastogi, J. F. Arvis, *The Eurasian Connection Supply-Chain Efficiency along the Modern Silk Route through Central Asia*, World Bank, Washington 2014, p. 63.

can take place on the premises of manufacturing plants that have their own rail terminals.

Rail transport may prove more attractive due to its lower impact on the environment. The train service organised by Fujitsu and Siemens, connecting China and Germany, is advertised as the Green IT train because it generates 95% lower emissions of CO₂, non-methane hydrocarbons and nitrogen oxides than the previously-used air transport. Global trends such as the increasingly stricter environmental requirements, combined with a greater environmental awareness on the part of customers, may cause a shift from air transport to rail transport, even if the latter offers a slightly longer delivery time⁷⁴. This may be particularly important for the luxury goods sector which is used to dispatching most of its goods by air⁷⁵. Rail is more favourable from the environmental point of view, especially when compared with air transport⁷⁶. It should be emphasised that at present container ships are fuelled by so-called heavy oil which is the cheapest fuel available on the market. It cannot be ruled out that the environmental factor will be decisive in raising the price of the maritime transport of goods in the future.

2. Transport of goods by rail – an added value for EU member states

Most experts assume that rail transport can only cover several per cent of the volume of goods transported from China and the EU and vice versa. However, the share of rail transport in the value of EU-China trade is likely to be much higher. At present, it is unlikely that one particular category of popular consumer goods will emerge that could be transported from China to Europe and back by rail. It is worth noting that rail transport is particularly favourable for high value and capital-intensive goods. As far as the value of goods is concerned, air transport should be the reference point, accounting

⁷⁴ Engineering & Manufacturing 2025+ Building The World – A DHL Perspective On Future Engineering & Manufacturing Supply Chains, 2015, http://www.dhl.com/content/dam/downloads/g0/logistics/white_papers/DHL_EandM_2015%2B_Building_The_World.pdf, p. 25.

⁷⁵ E. Jiang, What China's \$1 Trillion New Silk Road Spells for Fashion, 23 June 2017, <https://www.businessoffashion.com/articles/global-currents/one-belt-one-road-optimistic-fantasy-or-chinas-biggest-fashion-opportunity-yet>

⁷⁶ According to estimates by DHL, on the route from Shanghai to Vienna rail transport emits twice as much carbon dioxide as ships, but it emits much less of other harmful pollutants: 40% less non-methane hydrocarbons, 10% less sulphur oxide and three times less nitrogen oxides. See https://www.joc.com/sites/default/files/u48783/pdf/tpm_asia_2012/Ambrose_Linn.pdf

for a mere 1% of the weight of transported goods globally and for 35% of the value of global trade⁷⁷. The value of goods transported by rail between China and the EU in 2016 is estimated at around US\$ 22.9 billion, or around 4% of the total value of EU-China trade. Therefore, it may be cautiously assumed that in the upcoming years the proportion may rise to as much as 20%. This means that the share of the goods transported by rail in the total volume of EU-China trade will be bigger in terms of the value of the goods than in terms of their weight. This has major consequences for the distribution of carriage-related added value.

From the perspective of EU member states, the local added value generated by the China-EU rail connections is evident in three revenue categories: transit fees for the transportation sector, income earned by logistics companies, and other budget revenues earned by those states in which the customs clearance of goods imported from China is carried out. An increase in the number of transported containers will mainly translate into higher profits for the transport and logistics sectors. On the other hand, an increase in the value of the goods mainly affects the amount of import tariffs collected which in Europe are collected in the state in which the cargo is ultimately unloaded.

Table 5. The value chain related to the performance of a rail carriage

Organisation of carriage	Load preparation	Transportation	Unloading and further transport
Booking of rail infrastructure	Organisation of transport to the terminal	Transit fees	Unloading
Contracting carrier services	Load consolidation	Locomotive fees	Goods warehousing
Completing the order	Loading the containers onto a train	Cargo monitoring service	Customs service
Renting a container	Preparing documents	Customs clearance in transit states	Organisation of further transport if needed
	Paying export tariffs		Warehousing empty containers
	Insuring the cargo		Repacking of goods for retail customers
			Connecting subassemblies to evade tariffs

Source: The authors' own compilation based on industry-specific data

⁷⁷ Trends in the air-freight business, 14 April 2017, <https://www.economist.com/news/business-and-finance/21720901-fewer-electronics-are-being-flown-instead-planes-are-full-fresh-produce-trends>

The performance of the rail transportation of goods from China to Europe can be divided into four stages.

- **Stage one focuses on the organisation of the rail connection.** It involves a coordination of the timetables of several carriers operating along the route so that they are able to provide a locomotive at a given time, at a specific border crossing, of the given state, and to make infrastructure available (including tracks and trans-shipment terminals). This is done by an intermodal operator. A major portion of the intermodal transport market is dominated by Chinese companies in which the Chinese provinces have a stake.
- **Stage two includes the handling and completing of load.** If the volume of goods ordered by end-customer is too small to meet the capacity of the entire train, it is the task of the intermodal operator to collect a sufficient volume of goods and make sure that dispatching a specific cargo train is cost-effective⁷⁸. Frequently, the job of meeting the trains' capacity belongs to forwarding companies that cooperate with the operator and are able to reach the end customer. At present, a major portion of this market is controlled by multinational companies such as DB Schenker and DHL that are subject to increasing pressure from their Chinese competitors. Intermodal operators from China are trying to seize control of this element of the supply chain by offering forwarding services directly to the biggest customers. Numerous Polish companies are involved in freight forwarding as well. Forwarders' tasks include the transportation of goods to the terminal, and preparation of the necessary documents and insurance policies. When hired by big clients, intermodal operators try to work directly with end customers (bypassing the forwarding company).
- **Another stage involves logistics and transportation activities carried out after the train leaves the terminal.** At this stage, the main task involves making sure that the goods are transported in proper conditions and monitoring the train's smooth and uninterrupted travel along the entire route operated by specific carriers. The carrier acts as a subcontractor to the intermodal operator - carriage is performed by local rail companies

⁷⁸ As the regularity of the train service increases, these problems disappear since permanent timetables are introduced and clients are increasingly aware that the rail transportation of goods is one of the options they can choose from, which in turn helps meet the trains' capacity.

whose task it is to provide a locomotive that is suitable for local technical standards. In addition, other services are available along the route, including: cargo monitoring (for example to make sure that the wagon doors are locked), checking the conditions in which cargo is being transported (humidity, tremor/vibrations, temperature), as well as making sure that the train is travelling according to schedule (GPS tracking).

- **The final stage involves unloading the cargo, customs clearance and transport on from the terminal.** Numerous terminals also offer cargo warehousing services and the further intermodal transport of the goods. Onward transport is usually organised by a forwarding company. A forwarding company is able to organise transport from anywhere in the world and there is no need for its employees to be actually present in the place where the goods are dispatched, although this may facilitate the process of transport organisation. The goods can undergo customs clearance in the terminal which the train from China arrives at, or during a subsequent stage of transportation. There is a disproportion in the volumes of goods transported from China to Europe and *vice versa*, which creates the need to manage empty containers. Contrary to statements by the Chinese side, so far no balancing of the volume of goods sent from China to Europe and *vice versa* has been recorded. Rail connection operators sometimes fail to collect their empty containers for as long as fifteen months, which may limit the level of the utilisation of space available at the terminal regardless of the revenue earned on the fees paid for storing these containers⁷⁹.

⁷⁹ Interviews with trans-shipment terminal operators, March-September 2017.

Table 6. A division of revenues from transporting a container from one terminal to another

Forwarding company	Intermodal operator	Carrier	Infrastructure provider
Around 5% of the price of transporting a container (terminal-to-terminal)	Around 5% of the price of transporting a container (terminal-to-terminal)*	Jointly around 90% of the price of transporting a container (terminal-to-terminal)	
Contacts the client Acts as intermediary in selling train capacity In addition: Offers services to the client before the goods are loaded onto a train May offer cargo monitoring services during the train's travel Provides services after the goods reach the terminal	Organises the rail connection Negotiates with carriers and infrastructure providers Usually, contracts are signed for a term of at least several months, so the operator takes the risk that specific connections will not be realised regardless of the agreements made with the carriers and infrastructure providers	Provides a locomotive on the route section that runs through a specific state and performs the carriage of goods	Makes infrastructure available for the contracted train

* When carriage is subsidised, most frequently by the intermodal operator, it is difficult to determine the exact amount of profit earned from transporting the containers, most of the time this activity brings losses.

The official price cited for transporting goods between the EU and China by rail, i.e. US\$ 3,000-7,000 per one FEU container, covers the cost of transportation service performed between terminals in China and the EU. The revenues from this activity are split into forwarding companies that act as intermediaries in selling the carriage capacity, rail operators, as well as rail carriers and infrastructure providers (see Table 6).

As far as the fees for the transit of containers are concerned, estimates suggest that 90% of the train's price, i.e. around US\$ 300 million, goes directly to rail companies that transport the goods and to the operators that collect the fee for making infrastructure available⁸⁰. In 2016, Poland, which is assumed

⁸⁰ The basis for this calculation is the price offered on the market for one container (US\$ 5,000), but the actual cost of transportation (excluding the subsidy) is likely higher.

to collect a fee that is proportional to the distance covered by the train, earned around US\$ 13 million from this amount and will earn US\$ 40 million in 2020⁸¹. It should be noted that these figures include the fees for the trans-shipment of goods at border crossings and in the end terminal.

Carriage organisation and agency services connected with selling train capacity account for up to 10% of the container transport price. A portion of this amount is earned by Chinese companies that organise the connections. It is estimated that in 2016 1,702 trains were launched. They each transported 41 containers during one trip. Based on these data, it may be assumed that European intermediaries (forwarding companies) can earn US\$ 17 million annually (assuming that the forwarding company receives a margin of 5% of the order price being US\$ 5,000 per⁸²). This figure will rise to US\$ 50 million if the forecasts suggesting that as many as 5,000 trains will be operational in 2020 turn out to be correct. Compared with 2016, in 2017 the market is expected to grow by 80% and in 2018 – by 250%, unless the problems regarding the capacity of the terminal in Małaszewicze cause a reduction in the pace of development of the rail connection.

Forwarding companies will generate the biggest revenues on services connected with cargo pre-carriage and post-carriage. Therefore, the US\$ 17 million mentioned needs to be increased by the cost of additional services that the forwarding company may provide before the train departs from the terminal or after it arrives in its destination terminal. **Provision of these services considerably increases the added value that specific EU economies receive in relation with the rail connection.**

⁸¹ Chinese statistics show that 27% of the trains departing from China have their terminus in Łódź, and the remaining portion arrives in Germany. This means that 453 trains travel on the Małaszewicze-Łódź route, and the remaining 1,249 cross Poland. It should be expected that in practice this amount is higher by at least several dozen per cent due to the fact that the rates for providing the wagons and using the infrastructure are usually higher in the EU than in Russia and Kazakhstan.

⁸² No official statistics are available regarding the train capacity utilisation ratio for trains travelling from China to Europe and *vice versa*. According to the Polish Foreign Ministry, the average figure for China-bound trains is 50%. Information obtained during interviews with representatives of forwarding companies suggests that the figure for trains travelling from China to Europe is much higher. (Chengdu: Rail link with Lodz a chance for food industry, Ministry of Foreign Affairs of Poland, http://www.szanghaj.msz.gov.pl/en/news/chengdu__rail_link_with_lodz_a_chance_for_food_industry) Representatives of forwarding companies claim that the ratio is considerably higher for Europe-bound trains than for trains travelling in the opposite direction. Our assumptions are convergent with the forecasts by experts from the rail and logistics sectors.

Table 7. Examples of rates⁸³ for transporting one container from a terminal in Warsaw to selected locations (in US\$)

	Intermodal	Lorry	Terminal fees
Prague		2,400	
Budapest		3,000	30*
Munich		2,600	
Stockholm	2,200		90**

Source: Calculations based on data published on www.searates.com⁸⁴

*The estimated fees have been calculated on the basis of price lists for goods trans-shipment offered by intermodal terminals available at <http://clip-group.com/cennik/> and http://www.pccintermodal.pl/wp-content/uploads/2016/04/Taryfa_obsługa-pociagow_PL_final.pdf

**Higher terminal trans-shipment rates for goods travelling to Stockholm are related to the need for them to be trans-shipped in a land terminal in Warsaw, and then again in a sea terminal in Gdańsk.

Table 7 shows an example of the cost of carriage from the terminal in Warsaw to selected cities that are the recipients of goods transported from China by rail. Forwarding companies can earn around US\$ 250 on transporting one container from a terminal in China to a terminal in Europe, but further handling of the container can bring much higher revenues. If the goods are being transported to a more distant location, the forwarding company can hope to make additional revenue of around US\$ 2,600. This amount should be increased by extra profit from rendering unloading services at the terminal, which can be estimated at a minimum of US\$ 30 per container. A cautious assumption can be made that the cost of services rendered after the goods are transported to the terminal in Poland or from the terminal to end-customer may be US\$ 1,000 per container. Assuming that all trains incoming from China would have their terminus in one specific state and that the former assumptions are correct, additional revenues from these services would be US\$ 48 million in 2016 and US\$ 164 million in 2020.

⁸³ We consulted the rates with experts from logistics companies. The price is for a full truck load option due to the fact that one lorry can transport one container. Despite the fact that usually the volume of a container is smaller than the volume of a semi-trailer, it is not possible to load more cargo on the semi-trailer. The transportation price has been calculated for both directions, because most of the time the container needs to be returned to the terminal from which it departed, as it does not belong to the client.

⁸⁴ The www.searates.com website shows estimates only. They illustrate the likely proportion of revenue from handling transport incoming from China to revenue from further logistics of goods.

This amount should be increased by revenues from a number of extra services such as warehousing and packaging, which further increase the added value from logistics services provided to the EU-China rail connections.

Companies from Central Europe have an opportunity to compete for a portion of the forwarding services market, even though a major portion of these services is provided by global companies such as DB Schenker and DHL. Transportation services between the terminal and end-customer may be rendered by European forwarding companies not only in Europe but also in China. The forwarding company's brand and the fact that it has offices abroad may be important criteria which the customer considers when choosing their forwarding contractor. This is particularly true for global companies. As a consequence, companies from Central Europe may be in a less favourable situation than the largest global forwarders. However, the competitive advantage of smaller companies lies in their flexibility, which makes them tough competitors in the rivalry for the e-commerce market.

Table 8. Tariffs imposed by the EU on major categories of goods transported from China by rail

Type of goods	Textiles	Machines	Vehicles	Other industrial products
Tariff	6.6%	2.4%	4.1%	2.4%

Source: <http://stat.wto.org/TariffProfile/WSDBTariffPFView.aspx?Language=E&Country=E28>

From the point of view of direct budget revenue, revenue from tariffs may be the most profitable aspect of each rail connection. It should be emphasised that it is important to see the difference between the value of transported goods and their volume when calculating the financial gains that the rail transport of goods can bring to transit states. Some transport-related services such as transit fees depend on the volume of goods, while other services are determined by the value of goods, for example certain aspects of customs clearance and insurance. In the EU, the states are allowed to transfer 25% of tariff revenues to their budgets to cover the cost of tariff collection⁸⁵. Tariff revenues are an important source of income for EU member states, with major differences between individual states⁸⁶

⁸⁵ Wieloletnie Ramy Finansowe – słowniczek pojęć, Ministry of Foreign Affairs of Poland, <http://www.msz.gov.pl/resource/5baca434-1692-4cdd-8af0-62d281e53692:JCR>

⁸⁶ According to Eurostat, the countries with the biggest incomes from tariffs as a proportion of GDP include: Belgium (0.6% GDP), the Czech Republic (1.7% GDP), Germany (0.8% GDP),

According to estimates based on Chinese statistics, operators from Chinese provinces involved in rail transport to Europe have so far transported goods worth about US\$ 22.9 billion⁸⁷. Around 90% of these goods, i.e. products worth US\$ 20.5 billion were sent to Europe. Although the average tariff for goods imported to the EU is around 2%, the categories of goods transported by rail are usually subject to a higher tariff. Assuming that the average tariff is 4%, tariff revenues may amount to US\$ 800 million and the states that collect the tariff are entitled to transfer a quarter of this sum, i.e. US\$ 200 million, to their budgets. By 2020, the amount of tariff revenue may increase to US\$ 834 million (with an estimated overall trade value of US\$ 76.5 billion).

However, it should be noted that there are major disproportions as regards the value of goods transported by rail between China and Europe. Goods of the highest value, such as electronic devices and automotive parts, are transported from one manufacturing plant to another. According to estimates by Chinese customs offices, in 2016 453 trains that travelled on the Chengdu-Łódź route transported goods worth US\$ 1.5 billion, whereas 413 trains that travelled between Chongqing and Duisburg transported goods worth US\$ 17 billion⁸⁸. This means that from the perspective of Central Europe, countries that wish to generate higher tariff revenues should try to encourage investors to build manufacturing plants that use the China-Europe rail connections. This would enable Central Europe to take over some of the revenues from tariffs collected in Western European ports or to provide logistics handling of the biggest possible portion of the market of transporting goods to manufacturing plants in Germany.

The efficiency of customs procedures is of key importance for tariff revenues. In the EU, a tariff may be calculated at the location where the goods are unloaded or in the destination state. Therefore, some clients may be interested in performing the customs clearance of goods intended for the Polish market in Germany, similarly to the procedure applied for goods transported by sea. This decision may be the result of the greater digitisation

Ireland (1.5% GDP), Luxembourg (2.6% GDP), the Netherlands (1.6% GDP), and also Poland and Portugal (0.6% GDP each). These are mainly smaller states that operate major ports or are EU border states. The states with the smallest share of tariff revenues in their GDP include: Austria, France, Croatia and Italy (where tariff revenues account for 0.1% of GDP in each of these states).

⁸⁷ 2017年中欧班列步入发展“快车道”成都重庆计划“运力翻倍”(CR Express expected to enter the ‘fastlane’: Chengdu and Chongqing plan to double their capacity), *op. cit.*

⁸⁸ *Ibid.*

of German customs offices and the possibility to postpone the payment of import VAT. The limited capacity of the trans-shipment in Małaszewicze, which reduces the efficiency of customs procedures, is an extremely significant barrier to the development of rail connections and to the increase in tariff revenues.

Table 9. Potential economic benefits from the China-Europe rail connection (in US\$ millions)

Type of benefit	2016	2020*
Direct forwarding service (acting as intermediary)	17	50
Additional forwarding services	48	164
Service involving carriage and making infrastructure available	13	40
Tariff revenues	200	834
Total added value	278	1088

*This takes into account the assumption made by the government in Beijing that in 2020, 5,000 trains will be travelling between China and Europe, which is consistent with the estimates by experts representing container terminals in Małaszewicze. It is assumed that the train capacity utilisation ratio will increase from 70% to 80%. For customs revenues this will mean that the value of goods transported on one train will increase from US\$ 13.4 million to US\$ 15.3 million. The amount of US\$ 13.4 million has been calculated by dividing the total value of transported goods (US\$ 22.9 billion) by the number of trains transporting goods between China and the EU in 2016 (1,702).

Summing up the points discussed above, it may be stated that in 2016 the added value for EU member states generated by the rail connections was around US\$ 278 million, which may seem not much. However, it should be taken into account that over the next couple of years a high trade dynamic should be expected. As a consequence, the added value generated by the rail connections will rise to about US\$ 1.1 billion. It should be noted that this calculation omits the estimates regarding the market share of individuals states, although it is evident that a major portion of this revenue will be earned by those states in which the trains have their terminus.

3. Location of logistics centres and distribution of added value within the EU

The distribution of benefits generated by China-EU rail transport depends on the role of a specific state in the entire value chain. Transit states can mainly expect to generate revenue from business activities of rail carriers,

as well as revenue from fees for using local infrastructure. **The economic benefits are bigger in those states that host logistics centres in which the EU-China trains arrive and from which they depart.** Local companies can make a profit from providing agency services in selling carriage capacity and the further logistics handling of goods. In addition, a logistics centre can arrange customs clearance procedures for goods imported to the EU, which means that a quarter of the tariff revenues will be transferred to the budget of the state that hosts the centre. This is why EU member states located along the train's route compete for participation in the development of logistics centres intended to support China-EU rail connections.

The present Chinese logic of developing the China-EU rail transport market suggests that several principal logistics centres to handle the carriages are likely to be built in the EU. The process of optimising the connections on the Chinese side, which Beijing is currently implementing, will likely soon include the activity of Chinese intermodal operators in Europe. The connections will concentrate in industrial areas that have major potential for generating rail trade flows (the model of 'creating direct train connections between manufacturing plants'). Locations with a major logistics potential will also gain importance. Their task is to consolidate European goods dispatched to China and further distribute goods imported to Europe. This is intended to help boost carriage effectiveness, including by increasing the train capacity utilisation ratio, which is Beijing's primary goal.

So far, the China-EU carriages have been handled via the existing European inland terminals. An increase in the number of carriages may trigger the need to build new terminals and logistics centres, including in cooperation with Chinese companies, using Chinese capital. This possible cooperation was mentioned by China's Prime Minister Li Keqiang at the '16+1' summit in Budapest. **From the point of view of European business, it is of key importance to build open logistics infrastructure that could be used by both Chinese and European companies.** The ownership structure is also important because it determines which actors can have access to infrastructure and how profit will be distributed. The final location of logistics centres in the EU will depend on: the condition and traffic capacity of road and rail infrastructure (including a well thought-out modernisation strategy), a favourable regulatory framework and price regime adjusted to the needs of intermodal transport, preferential customs clearance procedures (for example delayed import VAT payments), the adoption of suitable regulations for e-commerce, and improved cooperation between different rail carrier companies.

From China's perspective, Poland is an attractive location for the logistics handling of rail trade with Central Europe, and partly also with Scandinavia and the southern and eastern regions of Germany. The favourable geographical location of Polish terminals facilitates the transportation of goods to more distant locations in Europe. According to Eurostat data, with a turnover of around 2 billion euros, Poland is the second largest provider of services related to rail transport after Germany (around 4 billion euros). Another advantage of Poland is the large number of price-competitive companies that offer road transport solutions used in goods consolidation and distribution in the EU. Large companies that relocate their logistics operations to Poland can hire Polish drivers and offer them lower salaries. Polish drivers are not allowed to freely transport goods to rail terminals in Western Europe⁸⁹. Poland's share in the value of warehousing services and additional logistics services is unimpressive. In 2015, Polish companies rendered services of this type worth 10.5 billion euros⁹⁰. At present, Łódź serves as a logistics centre to which goods are transported from the remaining part of the EU, intended for export to China. Around 25% of China-EU trains are handled there, accounting for around 7% of the value of transported goods.

At present, Slovakia, Hungary and Czech Republic, are also competing for the status of Central European 'hub'. So far, their role has been limited due to the problems affecting transit via Ukraine. However, after it was resumed to some extent in 2017, the governments of Hungary and Slovakia intensified their efforts to attract a portion of trade flows⁹¹. The attractiveness of Hungary may increase in the context of the future development of the sea-land connection through which goods from China reach Central Europe via the Greek port of Piraeus, which is controlled by the Chinese company COSCO. So far, the strategic importance of the border crossing in Terespol-Brest has been Poland's major asset. However, due to its limited capacity, Chinese operators may opt for alternative routes. Due to congestion at the trains' entry point to Poland, a portion of revenue from trans-shipment services is earned by the terminal in Brest

⁸⁹ This results from the European cabotage regime which limits the activity of foreign drivers in a specific state (for example in Germany). However, Polish drivers are allowed to transport goods from Germany to Poland.

⁹⁰ This was less than the figure for Spain (29 billion euros), the Netherlands (28 billion euros), France (75 billion euros), Germany (74 billion euros), the United Kingdom (79 billion euros) and Italy (58 billion euros).

⁹¹ Bratislava intends to handle 2,000 trains annually by 2020.

in Belarus, where goods are unloaded from wide track trains onto European standard trains.

Similarly, German cities are hoping to boost their revenue from handling the rail connections with China. At present, they are handling the biggest portion of EU-China rail trade in terms of value. Duisburg in North-Rhine Westphalia is serving as a logistics centre supporting the territory of Germany, Benelux and northern France. At present, EU-China rail connections generate around 5.4% of rail trans-shipment operations performed there. **Due to the proximity of the main industrial bases that use the EU-China rail connections, around 25% of all the trains travelling between China and the EU accounting for around 75% of the value of goods are trans-shipped in Duisburg.** Hamburg would also like to offer handling services intended for these connections. In recent years, the city has recorded a gradual drop in revenues from the trans-shipment of container ships⁹². It is worth noting that for some companies the service of unloading the trains that arrive from China accounts for 10-15% of their assignments⁹³.

The competition between Polish and German trans-shipment terminals

In the present situation regarding the structure of rail connections, trans-shipment terminals in Germany and Poland frequently compete for individual cargo flows. Numerous operators find it more cost-effective to transport goods from China to Germany and then to send them on to Poland. For example, DB Schenker offers a service involving the transport of goods from central China to Leipzig (which is located near Poland's western border) and on to Poland via Duisburg (which lies in western Germany), whereas the quicker option would be to unload the goods in central Poland and send them to Leipzig, so that they do not have to travel the same distance twice. For example, it seems that goods that have their end-point in Munich could be transported there via Łódź, rather than via Duisburg, which is a longer route. This logic of transportation reduces carriage efficiency and generates extra cost for Chinese intermodal operators.

⁹² Chinesen wollen im Hamburger Hafen landen, 14 July 2017, <http://www.handelsblatt.com/unternehmen/logistik-spezial/zoff-um-neues-terminal-chinesen-wollen-im-hamburger-hafen-landen/20057646.html>

⁹³ TCO setzt auf die Schiene - Bahncontainer von Hamburg nach China, <https://www.hafen-hamburg.de/de/news/tco-setzt-auf-die-schiene-bahncontainer-von-hamburg-nach-china---35323>

One of the factors that reduce Poland's competitive advantage is the present structure of price lists for intermodal transportation, which sometimes encourages clients to organise the unloading of their goods in Germany. Possible improvements on the part of infrastructure providers could involve the introduction of fees for using the infrastructure to encourage clients to use local rail terminals since, following trans-shipment, the goods would be transported further by rail anyway.

The expansion of logistics centres that handle China-Europe rail connections is a development opportunity for those regions of Poland that are struggling with structural problems. These include the Łódzkie, Lubelskie and Podlaskie provinces. The development of the rail connection may be an asset when looking for foreign investments to be carried out by companies that have their branch offices in China. Chinese investors that have their assembly plants in Poland, for example TCL, a producer of LCD screens with a manufacturing plant in Żyrardów, are among the clients that use the rail connections. The expansion of the rail connection network may help include Poland and Central Europe in new supply chains created under the model of 'creating direct train connections between factories'. For example, the duration of rail transportation from Zhengzhou to Europe is 12-14 days if the train has its terminus in Warsaw, which is shorter than the duration of a train's journey to Milan, Prague and Paris (16-18 days).

The development of the logistics centre in Duisburg as a development opportunity for the region

Duisburg is a prime example of how a neglected region struggling with structural problems may be given a development boost in the form of strategic investments. Back in the 1990s, the city struggled with numerous problems caused by the collapse of several heavy industry plants. At present, Duisburg is one of Europe's most innovative logistics hubs hosting all the major companies involved in goods freight. The city views the rail connection with China as an opportunity to strengthen its position as a major European logistics hub⁹⁴. However, in Germany there is controversy over whether Chinese investors should be allowed to purchase a stake in the port's operator company which also handles rail trade and is 66% controlled

⁹⁴ J. Kahl, Duisburgs Rettung kommt aus dem Fernen Osten, 4 April 2017, <https://www.nzz.ch/international/zugverbindung-china-deutschland-duisburgs-rettung-kommt-aus-dem-fernen-osten-ld.155297>

by the districts of North-Rhine Westphalia and 33% controlled by the city of Duisburg⁹⁵. There are voices suggesting that this is a method for China to increase its involvement in the region. So far, the port has signed a cooperation agreement with China Merchants Group regarding the development of the rail connection between China and Europe.

In recent years, German forwarding companies have offered a service which involves shipping goods from China to Duisburg by rail and then dispatching them on to Brazil or the USA by air. This mode of transportation takes around 22 days door-to-door, which is around 15 days faster than maritime freight and much cheaper than air freight. If Polish airports were able to compete for this market, the amount of possible revenue could rise considerably. Perhaps also Poland's airports, in particular the planned Central Transportation Port, could compete for a portion of intermodal transport between Asia and North and South America.

4. The trade balance

The debate on the rail connections between Europe and Asia often uses the argument that they will trigger an increase in the trade balance disproportion between Europe and China. This disproportion is unquestionable and results mainly from structural differences between the two regions. However, focusing too much on this aspect alone may prove to be too simplified an approach.

The trade balance statistics do not reflect reality as a whole. In numerous cases they categorise internal trade carried out by global companies as trade between specific states. For example, the activity of a German company that has a manufacturing plant in China and delivers components used in the production of cars to Germany will be categorised as export from China to Germany, regardless of the fact that the profit from the production of components is earned by the German company. This profit can be transferred to Germany in the form of dividend payments or another form of financial transfer. Similarly, the export of batteries from Samsung manufacturing plants in China to Europe is also viewed as China's export. Therefore, a more comprehensive approach is needed to analyse not only the flow of goods but also the flow of capital. **China's rising export figures may be the result of increased investments carried out by Western countries in China, rather than a wave of Chinese products flooding the European market.**

⁹⁵ *Ibid.*

From the point of view of Central Europe, one-sided analyses of its trade balance with China may be confusing. The deficit partly results from the fact that individual countries play various functions in the supply chains operated by global companies. This is due to the fact that, if China produces components for German cars that are assembled in Poland, this increases Poland's imports. The product, made from Chinese components, is later sold on the European market, which simultaneously contributes to a rise in Poland's exports. This portion of import from China is *de facto* beyond the control of individual states because it is carried out by multinational companies present in Central Europe as part of their operating strategies. From this perspective, launching a competitive method for delivering goods from China by rail will cause an increase in Central Europe's trade deficit with China while simultaneously boosting the region's trade surplus with states which are end-product recipients.

It is interesting to analyse the trends recorded in China, which clearly indicate that China's cost advantage over Central Europe is dwindling. In the difficult years following the global financial crisis, the Chinese market has become a major driving force of exports for numerous highly developed states. The demand of China's expanding middle class for high value goods, such as cars, has been on the rise, which makes the Chinese market increasingly attractive for the automotive industry⁹⁶. **Consideration also needs to be given to whether the development of the rail connection could possibly trigger the process of production offshoring to reduce production cost.** China should not be viewed as a homogeneous entity. In recent years, salaries have risen in particular in the coastal regions, whereas in central China, which has the most convenient rail connections with Europe, salaries are still much lower. Rail transport may also help to boost the stability of supplies from China by offering relatively fast and inexpensive emergency deliveries of goods on special order. In this sense, this could be an additional argument in favour of maintaining factories which produce goods for the European market in China instead of moving them to Central Europe. On the one hand, **the rail connections may be viewed as a method for supporting transport from those regions of China which hold a cost advantage over Central Europe.** On the other hand, forecasts published by various research centres indicate that, in the

⁹⁶ In 2007-2014, China's share in the global sale of new cars increased from 10% to 28%, and in 2010 the Chinese market became the world's largest automotive market. For example, in 2009-2014 the share of automotive companies from Germany, for which Central Europe is their main supplier, in the Chinese market increased from 18.6% to 24.1%. This suggests that the Chinese market generated demand for Polish-made components used to manufacture German products.

upcoming years, central China will likely be developing at a faster pace than the coastal areas; this is one of the goals of the government in Beijing. This, in turn, means that central China's **purchasing power will grow, triggering increased demand for European goods**. It seems that the global trends involving multinational companies offshoring their operations, in this case to China, have been on the wane mainly due to increasing labour costs⁹⁷. Aside from this, other criteria such as the promptness and reliability of delivery are becoming increasingly important for the producers. From the perspective of German companies which invest in both China and Central Europe, the two regions do not compete with each other because their roles are different. A company's involvement in manufacturing operations in China usually serves the purpose of supplying goods to the local market, whereas Central Europe is becoming a location in which to manufacture industrial products intended for the EU market⁹⁸. Moreover, due to China's population ageing so rapidly, its labour reserves will also dwindle rapidly, which will make it difficult to maintain the present foreign expansion model based on a low labour cost.

⁹⁷ J. Donaubauer, Ch. Dreger, *The End of Cheap Labour: Are Foreign Investors Leaving China?*, Discussion Papers, Nr 159, Published by the German Institute for Economic Research, Berlin 2016.

⁹⁸ K. Popławski, *The role of Central Europe in the German economy. The political consequences*, Centre for Eastern Studies, Warsaw 2016, <https://www.osw.waw.pl/en/publikacje/osw-report/2016-05-16/role-central-europe-german-economy-political-consequences>, p. 38.

V. MODELS OF BUSINESS COOPERATION WITH CHINA BASED ON RAIL CONNECTIONS

When analysing the models of using the China-Europe rail connections it is worth emphasising that the differences between individual models do not prevent companies from using several of them jointly to carry out their business operations.

1. Direct connections between factories operated by global companies

Frequently, creating direct rail connections between manufacturing plants is a method for saving time and transportation costs. This model of transportation is used by companies operating in the automotive and electronics sectors, in which being able to adjust the production to changing consumer preferences is an important determinant of success. In the automotive industry, the efficient coordination of manufacturing plants by arranging fast and reliable deliveries is equally important. This method is used under the just-in-time production model, in which the number of stored parts and sub-assemblies is reduced to the necessary minimum. In these sectors, using rail to transport goods makes it possible to shorten the delivery time by 12-15 days, This means that train transportation generates savings on the time of freezing the capital of the transported goods. To ensure the secure transportation of components, in particular in the electronics industry, the use of containers offering a stable temperature is necessary.

The application of this model of using rail has been facilitated by the transformation which China went through. In recent years this has resulted in developmental differences emerging between the central and the coastal regions. Initially, global companies located their production in the vicinity of ocean harbours, which enabled them to use the cheapest method for transporting products from China to Europe, i.e. sea freight. However, in recent years, the coastal provinces' cost advantage has fallen, for example due to: the rise in salaries, the introduction of stricter labour laws, increasingly frequent congestion in the harbours, and the incentives offered by the government in Beijing to invest in central China. As a consequence, a portion of companies decided to locate their manufacturing plants in the central and western provinces. In this model of using rail transportation, global companies often try to locate their manufacturing plant in China in such a way as to make it possible to dispatch goods from there by rail to a plant located in Europe. Provided

that this connection is well-organised and the company has a sufficient turnover, it is possible to create a connection which will have a cost advantage over maritime transport, taking into account the cost of the capital involved and the delivery time. In such a case, the company usually hires an entire train which it loads with its goods. A train service of this kind may be regular, if needed. This makes it possible to improve delivery logistics and reduce the time needed to arrange transportation to a single day instead of the usual five days or more.

Under the manufacturing plant connection scheme, companies hire entire trains to transport their goods. This is favourable for them both in terms of cost and of the duration of transportation. Firstly, with a regular train service ordered by specific companies, it is possible to guarantee relatively stable timetables because the transported goods are homogeneous and customs services in individual states may apply simplified procedures so that there is no risk that a given batch of goods may be stopped or returned due to its non-compliance with local laws or formal mistakes. Secondly, when goods are transported from one plant to another, the train is able to collect them directly from a factory, in which a suitable rail terminal is located and transport the goods to the nearest terminal from the point of view of the destination plant. This is why the duration of door-to-door delivery is not necessarily different from the duration of delivery from one terminal to another. For example, the transportation of goods manufactured in a factory in Chengdu in central China to a harbour takes around 3 days, whereas over the same period a cargo train hired to transport these goods is able to cover a quarter of its total distance from China to Europe⁹⁹.

Due to the fact that a cargo train is able to transport considerably fewer containers than a container ship, its full capacity can be contracted by one company, whereas the logistics connected with the loading and unloading of goods onto large container ships is much more complex and less flexible. This was one of the causes of goods congestions in Chinese ports in recent years. Moreover, the transportation of goods by ship may be delayed due to bad weather¹⁰⁰.

⁹⁹ M. Kuntz, Die rollende Seidenstraße, 27 April 2015, <http://www.sueddeutsche.de/wirtschaft/von-westeuropa-nach-china-die-rollende-seidenstrasse-1.2454706>

¹⁰⁰ Joint Study on Developing Euro-Asian Transport Linkages, 2008, https://www.unece.org/fileadmin/DAM/trans/main/eatl/in_house_study.pdf, p. 85

The significance of rail connections for the automotive industry

German automotive companies, such as Audi, BMW and Volkswagen, use rail transport to dispatch car components from Germany to their factories in western and central China. For example, BMW sends 3-7 trains to China weekly. For the automotive industry, transporting car parts from the west to the east by rail is not a novelty. European companies used to send disassembled vehicles to Russia by rail, where they were later assembled, to bypass Russian laws pursuant to which production can only be carried out in Russia. For example, Volkswagen has been sending disassembled cars from its factories in the Czech Republic and Slovakia to its plant in Kaluga since 2002¹⁰¹. Due to the fact that the connection has been operational for several years, the company was able to work out its own tools to monitor the efficiency and security of delivery. The process of transporting car parts is supervised by a rail carrier which has built a custom-made IT system for VW to enable the clients to check the location of the containers carrying their car parts on an ongoing basis. In 2008 alone, 1,250 trains transported 50,000 containers from the Czech Republic and Slovakia to Kaluga. From this point of view, transporting them to China would mean extending the present transportation route.

The significance of rail connections for the electronics industry

Hewlett-Packard was one of the first companies to transport its goods from China to Europe by rail. This mode of transportation has become even more attractive due to the global economic crisis causing global trade to decline and instability in the maritime freight sector. As a consequence, the duration of the delivery of goods from China to Europe increased from 26 days to 34-36 days¹⁰². Pursuant to a decision by the governments of China, Kazakhstan and Russia, HP manufacturing plants were included in a special customs zone, as a result of which the duration of transportation has shortened, because the trains did not have to stop for customs clearance. Currently, HP is sending 2-3 trains to China weekly and the transportation of goods in the door-to-door system takes 16-18 days.

¹⁰¹ *Ibid.*, p. 82

¹⁰² M. Bolle, A. Kortsari, Europe - Asia Railway Transport: Issues & Prospects, http://www.near2-project.eu/Portals/0/NEAR%202.DRAFT%2097_final.pdf, p. 53

2. High value goods

At present, mainly electronic devices, electrical machines, pharmaceutical and chemical products are transported from China to Europe by rail.

In the case of these products, delivery time is important and companies are ready to pay more in order for them to be transported faster. Unlike in the model of connecting manufacturing plants, to have high value goods transported by rail, companies can hire only a portion of the train's capacity and dispatch even small amounts of cargo. However, this is a logistics challenge as it requires proper organisation of the train's cargo, so that the train's capacity is met and border clearance procedures are more efficient.

Currently, delivering high-value goods is the main motivation for using rail connections. According to estimates, around 65-67% of rail deliveries are the delivery of goods with a relatively high value¹⁰³. For this type of goods, the advantage of rail transport over other modes of transport is the relatively small share of the transportation cost in the price of the end product. This means that the producer has a sufficiently high profit margin to enable it to earmark a portion of it to pay for the faster transportation of its goods. For producers of high value goods, being able to offer faster delivery can be their competitive advantage. It is also worth emphasising that a shorter duration of transportation of high value goods is beneficial not only for the clients (because it shortens the time they spend waiting for their order) but also for the producers who are able to make savings on lower costs of insurance, goods warehousing and a reduced time of capital freezing.

According to DB Schenker's calculations, the price of capital which cannot be used during the period over which the goods are being transported increases the price of sea freight by two thirds, whereas the corresponding proportion for rail transport is one third, which makes the two modes of transportation increasingly competitive. In the present situation, it should be taken into account that, due to low interest rates maintained by central banks across the world, this issue may not be of primary importance to the clients. However, it seems that in the upcoming years the cost of capital will rise due to the fact that central banks are abandoning the policy of quantitative easing, which will boost the importance of the cost of capital as a factor to be taken into account when deciding on the mode of transportation of goods from China to Europe and *vice versa*.

¹⁰³ *Ibid.*, p. 57.

3. Products with a short life cycle

The rail connection is popular with manufacturers of seasonal goods, in particular clothes. Due to specific deadlines for launching new clothing collections, the producers often wish to save time and do not want to pay excessive transportation costs. When launching new technological solutions or new electronic devices, companies often choose rail transport to be sure that the goods reach their destination on time.

Emergency deliveries of goods are a slightly different category of using rail transport. It sometimes happens that the client receives an order that does not meet all the criteria and standards specified in the order. If this is the case, sending additional batches of products is necessary, for example due to a strict merchandising deadline. In this situation, many clients choose delivery by rail, because they do not have a sufficient profit margin to afford to deliver their goods by air. Similarly, in those periods in which customer demand is difficult to estimate, for example before and after Christmas, companies choose to have extra deliveries dispatched by rail. It is also worth considering whether reducing the risk of problems with delivery from China to Europe can be an additional argument in favour of relocating production to China. European producers may also draw certain benefits from the opportunity to transport their goods to China in a fast and relatively cheap manner by rail. One interesting example is provided by the scandals over contaminated food in China, in particular powdered milk, which contributed to a rapid increase in demand for imported powdered milk.

Promotional campaigns and extra deliveries

Many hyper- and supermarket chains plan their promotional campaigns at least a few months in advance. This means that promotional materials such as leaflets showing products available at special price need to be printed in advance. It may happen that delivery of these goods is late due to problems with sea freight or that the delivered goods do not meet the prearranged quality standards. If this is the case, many companies decide to have another batch of goods delivered by rail. Many clients are regularly confronted with the problem of faulty goods and book train capacity on a permanent basis to be able to order an emergency delivery if needed.

4. Mail/e-commerce

Until 2013, it had seemed that, due to the level of complexity of the process of dispatching goods by rail, it would mainly be possible to transport such volumes of goods that would be sufficient to meet the full capacity of a container¹⁰⁴. **In 2014-2015, carriers managed to improve the efficiency of the connection's logistics so that now it is possible to dispatch a volume of goods that is smaller than the volume of one container.** This is possible because companies may rent smaller portions of container volume (expressed in m³). For example, it is worth noting that transporting one carriage of goods is twice as expensive and takes at least a few days longer than transporting an entire train¹⁰⁵. The difference results from the fact that no simplified customs procedures are possible, so the process gets extended on each of the borders the train needs to cross¹⁰⁶. Moreover, before the train departs there is the need to carry out a more complex and time-consuming goods consolidation and preparation of customs procedures. There is a growing risk that an entire container may be stopped due to mistakes in customs documentation. The cost of transporting a volume of goods that is smaller than the entire container volume is higher, and this is true for all modes of transportation. For example, transporting less than one containerful of goods by sea is 30-40% more expensive than transporting one full container of goods¹⁰⁷.

Despite these limitations, numerous logistics experts claim that, alongside the automotive and electronics sectors, the e-commerce industry will also benefit the most from the development of the rail connection. **Opening the rail connection to e-commerce is an opportunity to transport at least a portion of the market of parcels sent from Europe to China and vice versa. According to estimates, this market accounts for more than half of the parcels**

¹⁰⁴ C. Rastogi, J. F. Arvis, *The Eurasian Connection Supply-Chain Efficiency along the Modern Silk Route through Central Asia*, World Bank, Washington 2014, p. 46.

¹⁰⁵ *Ibid.*, p. 66.

¹⁰⁶ For example, on the route via Mongolia the train spends 30% of its journey time on customs procedures and two thirds of these excessively long procedures are the result of incorrect customs declarations. See http://fiata.com/fileadmin/user_upload/documents/recent_views/Working_Group_UIC_FIATA/2_UIC-FIATA_Vienna_23-24_April_2015_Presentation_Zhang_Zhao.pdf

¹⁰⁷ F. Gronkvist, *Shipping Costs When Importing from China - A Complete Guide*, 3.4.2017, <http://www.chinainportal.com/blog/shipping-costs-when-importing-from-china-a-complete-guide/>

sent from Europe to the rest of the world¹⁰⁸. Research shows that the fastest growing categories of goods sold in e-commerce between China and Europe are: sports equipment, clothes, jewellery, household goods and electronic devices¹⁰⁹. These products may potentially be transported by rail. A report by the Chinese company AliResearch contains similar findings – there is growing customer demand for express international parcels containing goods such as fashion items, jewellery and powdered milk, which are usually dispatched to customers by air¹¹⁰. According to our interviewees involved in doing business in China, the main advantage of e-commerce is the fact that it is subject to less strict regulations than traditional sale. In some sectors, companies find it easier to enter a market by offering online sale than by opening brick-and-mortar outlets.

The development of e-commerce may trigger certain fears because it offers Chinese producers an opportunity to sell goods in the European market at considerably lower prices and to dispatch their goods from low-cost locations in China. According to media reports, Alibaba, China's major online selling platform, is planning to use rail to expand its reach onto the European market and to build a logistics centre in Bulgaria¹¹¹. Until recently, various middlemen had been using local online selling platforms to sell products imported directly from China and ordered by a specific retailer. However, many clients were discouraged by the five-week delivery time. On the other hand, it is worth considering whether in the mid-term perspective Chinese producers might be interested in using online platforms to buy European goods such as food-stuffs and luxury items.

Rail transport may help boost the competitiveness of European producers on the Chinese e-commerce market. It should be emphasised that at present many online selling platforms operate based on one of two major models¹¹².

¹⁰⁸ E-commerce to benefit from rail-post relations, Union Postale, Nr 1/2016, http://www.ub.unibas.ch/digi/a125/sachdok/2016/BAU_1_147716_1_2016.pdf, p. 9.

¹⁰⁹ 2016 China Cross-Border E-Commerce (Export B2B) Report, <http://download.dhgate.com/files/White%20Paper.pdf>, p. 17.

¹¹⁰ Trends in the air-freight business, 14 April 2017, <https://www.economist.com/news/business-and-finance/21720901-fewer-electronics-are-being-flown-instead-planes-are-full-fresh-produce-trends>

¹¹¹ E. Jiang, What China's \$1 Trillion New Silk Road Spells for Fashion, 23 June 2017, <https://www.businessoffashion.com/articles/global-currents/one-belt-one-road-optimistic-fantasy-or-chinas-biggest-fashion-opportunity-yet>

¹¹² China Cross-Border E-Commerce Guidebook, <https://www.rvo.nl/sites/default/files/2017/03/Cross-Border%20E-Commere%20Guidebook%20FINAL%20FINAL.PDF>, p. 17.

In the first model, goods are stored in customs warehouses in China and are dispatched to the client when they are ordered. One advantage of this approach is the fast delivery of products to the client, whereas the high cost of warehousing the goods is the drawback. In the second model, goods are dispatched from Europe when they are ordered by a Chinese client, which extends the duration and increases the cost of their transportation. However, it reduces the cost of warehousing the goods and capital freezing. **The rail connection is an opportunity to reduce the duration of direct deliveries.** Logistics companies also emphasise that, unlike other modes of transportation, rail transport does not generate higher costs of transporting goods to customs zones, which makes it an attractive solution for those companies that intend to keep less stock in customs warehouses across China, i.e. closer to the customer, and which want to be able to replenish their stock faster.

5. The export of foodstuffs

Due to the fact that the trains are equipped with diesel locomotives, it is possible to transport goods in wagons that have a temperature control system¹¹³. Since 2014, some forwarding companies have offered an all-year-round service involving the dispatch of goods in wagons of this type. This could facilitate the rail transport of foodstuffs in the future. However, for this to be possible, Russia would have to lift its embargo on the import of foodstuffs, which in practice would also cover rail transit.

The export of foodstuffs and the Russian embargo

Russia introduced an embargo on the import of foodstuffs from the European Union in response to the sanctions Brussels imposed on it in connection with the Russian aggression in Ukraine. However, it should be emphasised that the sanctions introduced a ban on the import of foodstuffs from the EU, which Russian customs services have interpreted as also being a ban on transit. This is the reason behind the current problems with transporting foodstuffs from Europe by rail.

The rail transport of foodstuffs needs to be prompt and requires more efficient customs procedures. In some cases, customs officers stop the trains, especially on the Kazakh-Chinese border; this is a major barrier to transporting

¹¹³ M. Bolle, A. Kortsari, Europe - Asia Railway Transport: Issues & Prospects, http://www.near2-project.eu/Portals/0/NEAR%202.DRAFT%2097_final.pdf, p. 51.

fresh and frozen foodstuffs in particular. The prices on the Chinese internal market are attractive enough to cover the higher cost of transporting products by rail. According to industry reports, the rail connection may help boost Europe's exports to China, in particular berries, veal and powdered milk¹¹⁴.

Rail transport as a business opportunity for European foodstuffs producers operating on the Chinese market

In the case of foodstuffs, their country of origin should be perceived as a strong brand. This is of key importance for achieving success on the Chinese market. This brand should be associated with high quality and safety. If companies wish to use this market opportunity, it would be advisable to boost the recognisability of foodstuffs from Central Europe and to improve their marketing and design. For many Chinese consumers foreign fruit is a luxury product and its packaging design resembles that of chocolate boxes available in Europe. It is also necessary to create instruments to encourage foodstuffs producers to establish different forms of cooperation as part of their expansion in China. One characteristic of the Chinese market is the fact that retail chains often require the producers to be able to deliver very large amounts of goods which individual companies are unable to offer and this may hinder the process of concluding business contracts.

Recent market analyses suggest that, **due to the rising living standards of China's population and the country's ongoing urbanisation, the demand for imported foodstuffs is expected to grow dynamically**¹¹⁵. At present, China's import of foodstuffs is estimated at US\$ 7 billion. 22% of this import comes from Europe, 20% from North America and 20% from South-East Asia. **The rail connection may be an opportunity for European foodstuffs producers to gain a competitive advantage over their major global competitors.** The duration of the rail transport of foodstuffs from Europe to China, which is around two

¹¹⁴ P. Bosch, X. Zhang, From Freight Trains to Cold Chains: Building China's New Supply Chains for Fresh Food, Rabobank, 2015.

¹¹⁵ Forecasts by the Chinese statistics office suggest that by 2025 the consumption of beef per capita will increase by 40% to 7 kg, of dairy products by 35% to 13 kg, of fish by 20% to 50 kg, of chicken by 22% to 11 kg, of fruit and vegetables by 16% to 384 kg and of pork by 10% to 46 kg. This is why by 2020 China's import of beef is expected to increase by 20%, of pork by 9%, of poultry meat by 23%, of fresh dairy products by 81% and of fruit by 19%. P. Bosch, X. Zhang, From Freight Trains to Cold Chains: Building China's New Supply Chains for Fresh Food, Rabobank, 2015, p. 19.

weeks, would be comparable with the duration of the sea freight of goods from Australia and New Zealand (which is 12-14 days, although sometimes delivery from this region is performed by air) and much shorter than the duration of sea transport from North America (5-6 weeks) and South America (5 weeks). It is also worth noting that fruit and vegetables from Europe may complement China's imports from the states of the southern hemisphere due to the differences in the vegetation cycle. Further proof of the rising importance China places on the importation of foodstuffs is its increasing investment in the logistics of chilled products. Until recently, the Chinese market's distribution network was unprepared for this challenge. At present, even rail terminals are becoming prepared to handle imports of foodstuffs and to invest in proper warehousing facilities. The Chinese government is planning to increase its investment in foodstuffs logistics¹¹⁶, because it is aware that there is demand on the part of society for high quality safe food. This is a result of a recent series of scandals over contaminated food. The changing eating habits of the Chinese population will trigger increased online sales. In 2012-2015, the share of online sales of fresh food in the total volume of sold produce increased from 0.4% to 3.4% and at present is estimated at around 6%¹¹⁷.

The popularity of rail as a method for transporting foodstuffs will impact the pace of development of rail connections. Global air transport trends suggest that recent years have seen a downward trend when it comes to the weight of goods transported by air. One reason for this is the fact that electronic devices are increasingly more compact and that manufacturing plants are being relocated to the vicinity of the markets in which the products are sold¹¹⁸. The air transportation of high quality foodstuffs is contributing to an increase in cargo air traffic¹¹⁹. When foodstuffs are transported by rail, the use of refrigerated containers is necessary due to major temperature fluctuations, which may increase the transportation cost compared with standard carriage. Some producers have tested the option of transporting products that do not require refrigeration, such as wine and olive oil, in dry containers; however,

¹¹⁶ China aims to improve its logistics system to protect food safety, 22.04.2017, http://www.chinadaily.com.cn/business/2017-04/22/content_29040394.htm

¹¹⁷ E. Li, Fresh Food E-Commerce in China, 2016, http://www.fedefruta.cl/2016/wp-content/uploads/2016/12/1430-1600_Li.pdf

¹¹⁸ Trends in the air-freight business, 14 April 2017, <https://www.economist.com/news/business-and-finance/21720901-fewer-electronics-are-being-flown-instead-planes-are-full-fresh-produce-trends>

¹¹⁹ *Ibid.*

this option did not turn out to be feasible¹²⁰. Improving the efficiency of the rail connection and enabling the more intensive transportation of foodstuffs is not only an opportunity but also a threat, as it may trigger increased import from South-East Asia and Australia to Europe.

JAKUB JAKÓBOWSKI, KONRAD POPŁAWSKI, MARCIN KACZMARSKI

¹²⁰ B.B. Munoz, It costs twice as much to export olive oil from Spain using China's "One Belt, One Road" railway, 18.05.2016, <https://qz.com/686816/the-view-from-spain-chinas-one-belt-oneroad-railway-is-an-unnecessary-folly/>