The New Silk Road: logistics disruption in the North-West European port system?

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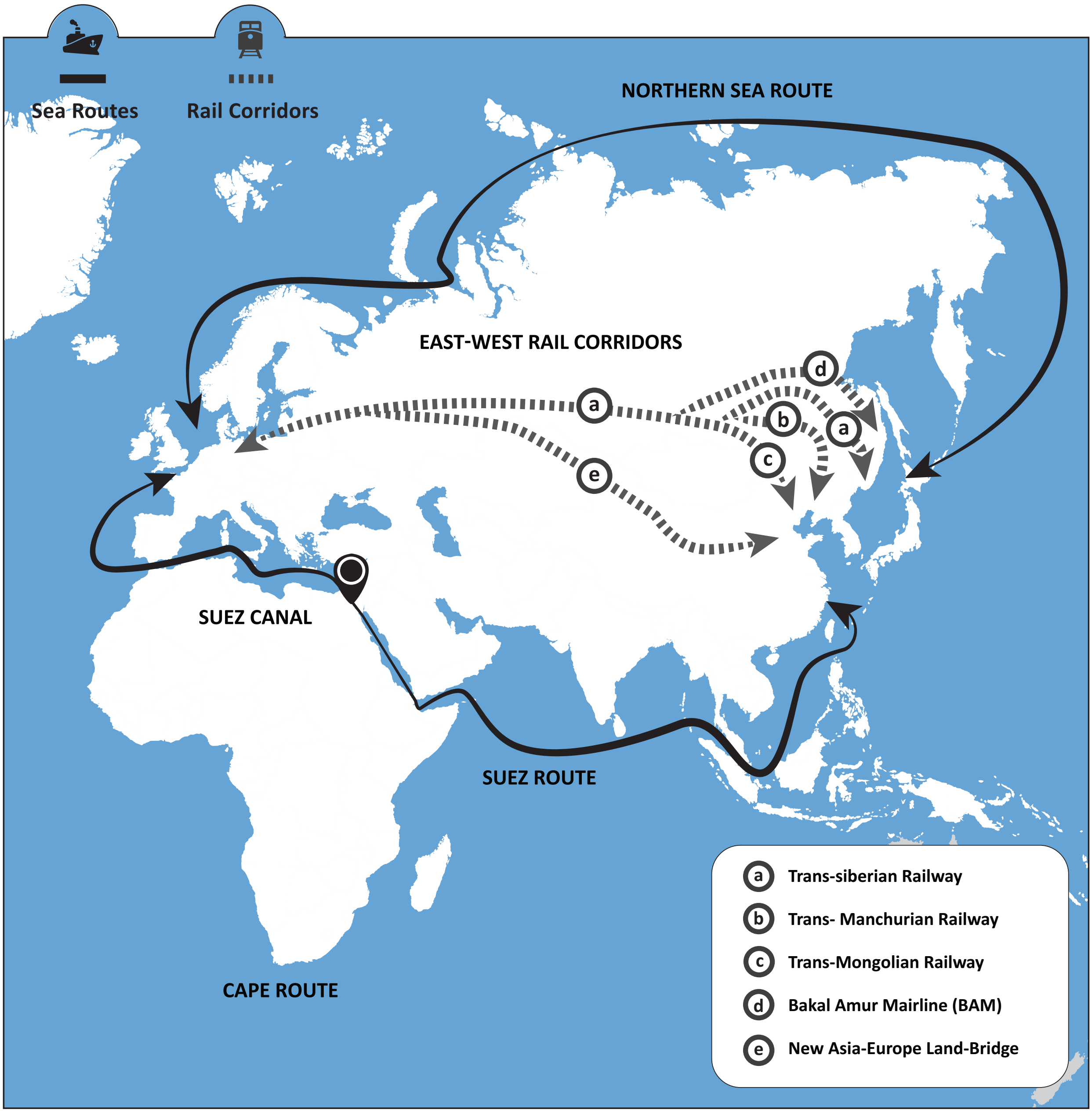
Introduction

The East-West route between the Far East and Europe is—together with the Pacific route between Asia and the Americas—a dominant route for containerised trade, traditional served by deep-sea transport and making use of large container hubs such as Shanghai, Hong Kong, Shenzhen or Singapore in Asia and Rotterdam, Antwerp or Hamburg in Europe. Since 1967, the first containers were transported by rail between the Far East and Europe in the so called Trans-Siberian Landbridge. Since 1971 this landbridge became an accepted container route (Hayuth, 1987). Recently, a number of alternative routes emerged: a new, revitalized landbridge, a northern route (Infographic 1) and the 'One Belt, One Road' initiative. Especially this One Belt, One Road (OBOR) initiative is seen as a game-changer for global logistics flows and as a potential force for disruption of current logistics practises and structures—some even expect a return of a 'global around the world transport system' because of the OBOR initiative (Haralambides, 2017). In this chapter we present our vision on the impact of One Belt, One Road, or the New Silk Road, for the ports of North-West Europe. First, we present the OBOR concept in more detail in section 2. In section 3 we identify driving forces for this initiative. In section 4 we take a closer look at OBOR-logistics investment in Europe, in section 5 we present a comparative analysis of different transport routes between Europe and the Far East and assess the competitive position of OBOR. In section 6, possible effects on the North-West European port system by OBOR are identified and in section 7 we present possible strategies by the ports and maritime stakeholders of North-West Europe to react on OBOR. Finally we present some conclusions.

'New Silk Road' concepts

"Yi dai, yi lu", 'One Belt, One Road (OBOR)', the (Maritime) 'New Silk Road'. These concepts refer to Chinese President Xi Jinping's 2013 initiative to create a modern, USD 890 million version of the ancient silk road (Johnson, 2016)—in total, cumulative OBOR investment will be USD 4 trillion (The Economist, 2016). In this chapter we distinguish between the 'Maritime Silk Road' (One Road) and the land based 'Silk Road Economic Belt' (One Belt). In its simplest form OBOR is an infrastructure project that aims to establish a transport corridor that connects 4.4 billion people (Notteboom, 2016). Chinese investment is increasingly directed to the Silk Road. Investment in ports, like in the port of Piraeus by Chinese shipper Cosco Shipping Lines, is an important part of the project but also investment in a Chinese-designed nuclear reactor is included (The Economist, 2016). Other authors place more emphasis on the socio-economic motives of the initiative (Johnson, 2016) or the future place in the world order China wants to gain by the initiative (Ferdinand, 2016).

New East-West intermodal routes: initiatives before the New Silk Route/OBOR



Infographic 1 - Source: SRM on Tavasszy *et al.*, 2011

To speed up the actual development of the concept the Chinese government set up the 'Silk Road Fund', a 40 billion USD investment fund to invest in projects related to the initiative.[1]

[1] Among the investments backed by this fund are a hydroelectric dam in Pakistan, stakes in a Russian LNG project, part of the SIBUR Holding (Russia's largest gas processing and petrochemicals company), and a rumored acquisition of a Kazakhstan goldmine currently owned by commodity trader Glencore.

A second source of funding comes from the Asian Infrastructure Investment Bank (AIIB), which is planned to have a capitalisation of USD 100 billion. China is expected to fund around 50% of this investment bank (Lin, 2015). However, at the moment, only 50 billion USD of the total of nearly 1 trillion planned has been spent (Haralambides, 2017).

Drivers for OBOR

The OBOR project should be seen as more than just building infrastructure links or adding nodes to logistic networks. Also societal, geopolitical and economic challenges are to be addressed by the project. Both domestic affairs and international affairs play a role in the project. Analysts see China more and more playing an active role in safeguarding its economic interests around the world. The growing confidence of the China Communist Party (CCP) led to a more outward view to the world, making ambitions like OBOR possible (Ferdinand, 2016). We identify eight driving forces for OBOR.

1. Trade facilitation; the export of finished products by China and—even more important—access to energy commodities and raw materials (Lin, 2015) are mentioned as important drivers for the New Silk Road. Also the withdrawal by the USA government from the Trans-Pacific Partnership and the new role of China as the 'unquestionable global force of international trade' (Haralambides, 2017), replacing the USA, and focusing on regions like Africa, the Mediterranean, Russia and Iran, is an important driver for OBOR.
2. Geopolitical: bringing more countries under Beijing's influence by literally tying them to China (Casarini, 2016) and strengthening the global power of China, without causing conflict (The Economist, 2016). In addition, the important trade route via the Suez-canal and the Strait of Malacca are seen as very sensitive for geopolitical turmoil. The development of alternative routes therefore is important.
3. The desired diversification of the Chinese economy. The long lasting trade surpluses of China resulted in large amounts of foreign currencies. Finding investment opportunities abroad to diversify the Chinese investment portfolio is of utmost importance (Prasad, 2015).
4. Speeding up economic progress in underperforming Chinese regions. In recent years wages in China have risen sharply (Tate *et al.*, 2014). Especially in coastal regions wages are growing rapidly leading to companies moving either to inland locations—the 'Go West' strategy—where wages are lower or even to other

countries like Myanmar.[2] The rising inequality between Chinese regions is seen as a problem. Several provinces in western China are structurally underperforming (Johnson, 2016). These provinces, like Gansu, Guizhou, Qinghai and Xinjiang, have average incomes that are only around 25% of those in some of the richest coastal provinces (Ferdinand, 2016). The national focus on the OBOR project had led to almost every Chinese province investing heavy in logistics infrastructure (Johnson, 2016) and according to Notteboom (2016), territorial integrity of China is also an important driver for these developments.

5. Logistical connectivity; the move to inland China poses logistical challenges as some inland locations have inferior connections to the main exporting seaports in the eastern Chinese coastal regions. In contrast, Europe has become more accessible and is increasingly attractive for land based transport between China and Europe. From the European perspective, the geographical shift in China towards the west is mirrored by a shift towards the east in Europe. Eastern Europe showed the fastest economic growth in Europe in 2001-2014 (Hintjens *et al.*, 2015) and showed the biggest improvements amongst desired locations in Europe for logistics real estate (Prologis, 2016). The transport distance between the development regions in Western China and Eastern Europe is decreasing.
6. Another motive for the Chinese government for the development of OBOR is that it can foster demand for some Chinese industrial sectors facing *overcapacity* (Casarini, 2016). The steel industry is among the sectors that could benefit heavily from the construction of important transport infrastructure of other infrastructure (cities, industries etc.).
7. Especially the increasing sophistication of Chinese production is demanding for more time-sensitive transport. Deteriorating performance of deep-sea container transport therefore demands for alternatives, such as rail transport. The practise of (super) slow steaming of ultra large container vessels, low service reliability and port and hinterland congestion results in high costs for trade flows of expensive or time-sensitive products (Maloni *et al.*, 2013, Van Hassel *et al.*, 2016). Rail transport is increasingly seen as an alternative for slow steaming or expensive air-cargo. Because of the serious disruptions of Europe to Asia deep-sea services because of capacity shortages in the spring of 2017, DHL handles more rail shipments between Europe and Asia in both directions (Lloyds List, 2017).

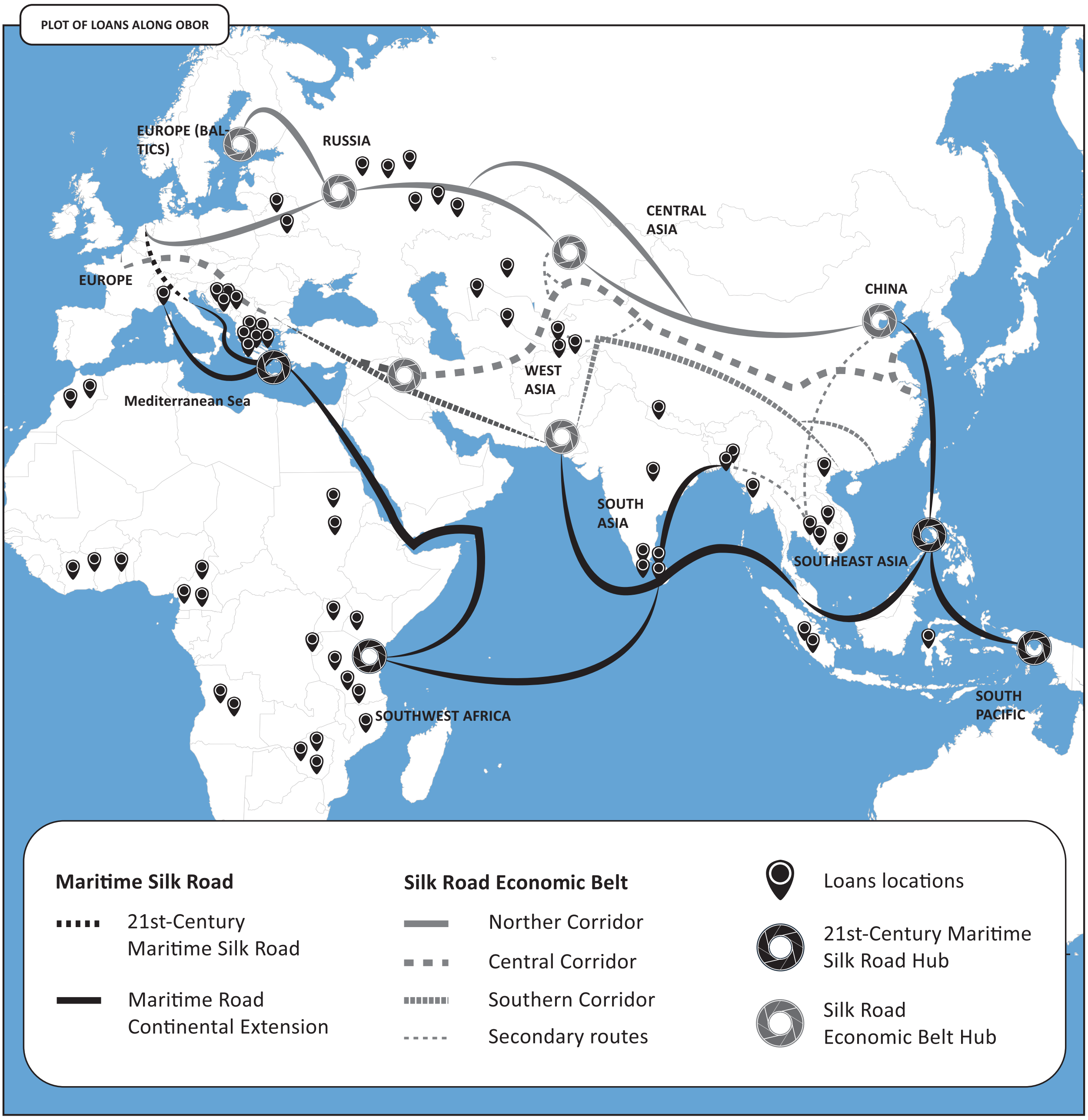
[2] Please see http://www.economist.com/news/briefing/21646180-rising-chinese-wages-will-only-strengthen-asias-hold-manufacturing-tightening-grip for more information on this topic.

8. The development of China as a maritime power and China's focus on sea lines of communication (SLOCs) as put forward by Lin (2015), are also important drivers for OBOR. Around 80% of oil imports into China are brought in via ocean transport. Under the presidency of Hu Jintao strategic steps were taken to develop China as a maritime power. The maritime silk road (MSR) initiative provides funding for investments in maritime infrastructure along the Indian and West Pacific Oceans (Lin, 2015). The geographic scope of the maritime silk road is much larger than the land based silk route. In 2016, Chinese state owned Landbridge Fund signed a 99 year lease for the Northern Australian port of Darwin. This move led to increased emphasis on the geopolitical background of this Chinese presence in Australia and is an illustration of an eastward direction of OBOR. To the west major investments are made in seaports that are en route between China to Southeast Asia, Sri Lanka and India, Kenya, and continuing to Europe (Piraeus).

A closer look at OBOR-logistics investment in Europe

The maps of the New Silk Road, such as presented in Infographic 2, indicate that both the Silk Road Economic Belt as the Maritime Silk Road are made up of different connections: it can be seen as a network, developed around some important maritime and dry hubs and connecting four continents. But the logistics infrastructure development is accompanied by a large number of loans locations by the China Development Bank and the China Ex-Im Bank. Especially, the number of loan locations in the Balkan Peninsula is striking. China has a special interest in the political and economic co-operation between the countries of Central and Eastern Europe. However, at the moment investment in Central and Eastern Europe is in line with lagging investment in OBOR as a whole and is indicated by "Mixed results and modest prospects" (EIU, 2016).

One Belt, One Road overview, including locations for loans



Infographic 2 - Source: SRM on China Investment Research

One Road: Maritime Silk Road investment

As stated before, this maritime infrastructure serves different cargo segments. When we look at investments made there is a distinction between ports infrastructure that focuses on the energy sector and those investments that focus on the container segment. One of the early investment projects of the Maritime Silk Road is the 2012 construction of an oil pipeline between Myanmar and China. Via this pipeline the geopolitical sensitive Malacca strait can be bypassed (Zhao, 2012). Further to the west, in Tanzania, China is working on the master plan for the Bagamoyo megaport development[3]. Further north when sailing to Europe China's significant role in the Egyptian economy should be noted (Luft, 2016). Next to ambitious plans by the China Fortune Land Development (CFLD) to construct a new capital to the east of Cairo, the involvement in the Suez Canal Corridor Area Project is worth mentioning. With Chinese money and expertise the industrial zone around the new expanded Suez Canal is developed.

Maritime Silk Road projects in the Mediterranean

In Europe most attention has been paid to seaports in South-Eastern Europe coming under Chinese influence. Investments and acquisitions done by Chinese state owned enterprises range from Piraeus and Venice to small scale terminal investments in ports of lesser importance. In 2009 the Greek government granted a 35 year concession for the operation of the port of Piraeus to Chinese Cosco Pacific (Van der Putten, 2014). The overall value of the deal for the whole concession is estimated to be around 1.5 billion euros[4]. In the wake of the severe financial crisis the Greek government sold off several state owned infrastructure ventures. In another transaction the Hellenic Republic Asset Development Fund (HRADF) for instance sold fourteen airports to German airport operator Fraport. The deal between the Greek government and Cosco Pacific included significant investments in modernisation and expansion of the port of Piraeus. Expansion of capacity is said to be up to 6.5 million TEU/year, up from 3.1 million in 2013.[5] The Chinese involvement led to Piraeus being the third fastest growing major container port in the world in 2016, with a rise of 10.4% in 2015 from 3.3 to 3.7 million TEU (Nightingale, 2017). One of the drivers for this growth has been the relocation of distribution operations of (Chinese) electronics producers to the port of Piraeus (Van der Putten, 2014). Further development as a hub might be steered by Chinese plans to buy Greek railway operator OSE and to develop the currently very underdeveloped freight railway network across the Balkans. In early 2017 concerns were voiced by the European Commission over the construction of these Balkan railway links.[6]

[3] There are serious concerns however about the viability of this 20 million TEU/year port development, see: IHS Fairplay, February 2016 "Bagamoyo port project shelved".

[4] http://www.joc.com/port-news/european-ports/port-piraeus/greece-cosco-china-finally-seal-piraeus-port-sale_20160705.html

[5] https://www.porttechnology.org/news/piraeus_becomes_meds_third_largest_for_container_traffic

[6] https://www.forbes.com/sites/wadeshepard/2017/02/25/another-silk-road-fiasco-chinas-belgrade-to-budapest-high-speed-rail-line-is-probed-by-brussels/#7118da5c3c00

A second European seaport that attracted significant Chinese investment is the Port of Venice. Also Venice is one the key ports in the Maritime Silk Road strategy (Notteboom, 2016). Here the North Adriatic Port Association (NAPA), a consortium of the ports of Venice, Trieste and Ravenna, supported by the Italian government, is trying to lure Chinese investors to invest in dry-docks to service large Chinese vessels (Casarini, 2016). In July 2016 the port authority of Venice signed a deal with the port authority of Tianjin for closer cooperation on port development. One of the first infrastructure developments in Venice under these new developments is the start of dredging for the Venice Offshore Port. This project will be undertaken by the China Communication Constructions Company Group (CCCC).

In several other ports in Europe Chinese terminal operating companies or shipping lines own assets. Major players include China Cosco Shipping Group and China Merchants Holding (CMHI). The list of ports with terminals (co-)owned by these companies include large ports like Antwerp, Rotterdam and Le Havre (Notteboom, 2016). The impact of these maritime investments in Europe on the ports in North-Western Europe will be dealt with later on in this article.

One Belt: Investments in rail infrastructure

While many hold the belief that the whole New Silk Route is the successor of the old Silk Route of the middle ages we have seen similar logistics concepts in more recent times. In 1907 a Japanese steamship line used the Trans-Siberian railway line to carry cargo and passengers from Vladivostok to Europe (Hayuth, 1987). But we want to focus on the Asian landbridge concepts of the 1980s (Poeth & Van Dongen (1983), Hayuth (1987) or Ducruet *et al.* (2009). A landbridge is seen as the utilization of land transport for a part of what would normally be entirely an ocean voyage (Hayuth, 1987). At the core of this concept was the use of the Trans-Siberian and Baikal Amur railways to ship mainly Japan made goods from the factories in Japan to Europe. As the Iron Curtain was still in place, the ports of Tallinn (Estonia) and Odessa (Ukraine) served as the most western nodes from where goods were transshipped for further distribution in Europe. Japan even had its own global development strategy that contained elements we see in the OBOR vision today (Poeth & Van Dongen, 1983)[7].
It is estimated that the Asian landbridge had at its peak a market share of over 12% in total container traffic between Asia and Europe (Vellenga & Spens, 2006).

[7] For Japan the key emphasis was on unrestricted access to important sea links and land bridges (railways, etc.) and the development of infrastructure like a second Panama Canal.

It has to be noted that containerized traffic between Asia and Europe was much smaller back then.

The role of Japan being a supporter of this development continued also after the dissolution of the Soviet Union (Hickok, 2000). In the mid-1990s, Japan provided loans for reconstruction and expansion of the China-Kazakhstan rail connection (Otsuka, 2001). In 1995 volumes carried by rail between China and Kazakhstan were reported to be up to 12.000 TEU per year (Shu, 1997). Around the year 2000 the potential for using these landbridges for (intermodal) freight transport was said to be limited because of regional fragmentation and outdated/missing infrastructure. Even in the outlook for the early 2000s no role for China was seen as main proponent for further development of the Asian landbridge (Otsuka, 2001). Only in 2004 for the first time the China Communist Party launched to idea of the New Silk Road via its main media outlet (Lin, 2011). In recent times the role of Japan in the development of the new silk road seems to have decimated. In 2008, when China, Mongolia, Russia, Belarus, Poland and Germany agreed to create conditions to pave way for regular container train service between Europe and Asia (Lin, 2011), Japan was out of the game.

In the 1990s a railway link between China and the Trans-Siberian railway via Kazakhstan was completed. In the OBOR railway link, Kazakhstan plays a central role. From a logistics point of view the difference in rail gauge can be bothersome. Both China, and most of continental Europe, make use of the so called 'normal gauge'. The railways in Russia, and most former CIS countries make use of broader railway tracks. This difference means that containers either have to be transshipped or that special railway carriages should be employed.

Recent rail initiatives

The OBOR rail connection is a complex rail network with a number of railway lines, corridors and inland port cities (Table 1 and Infographic 3).

The current rail lines between China and Europe

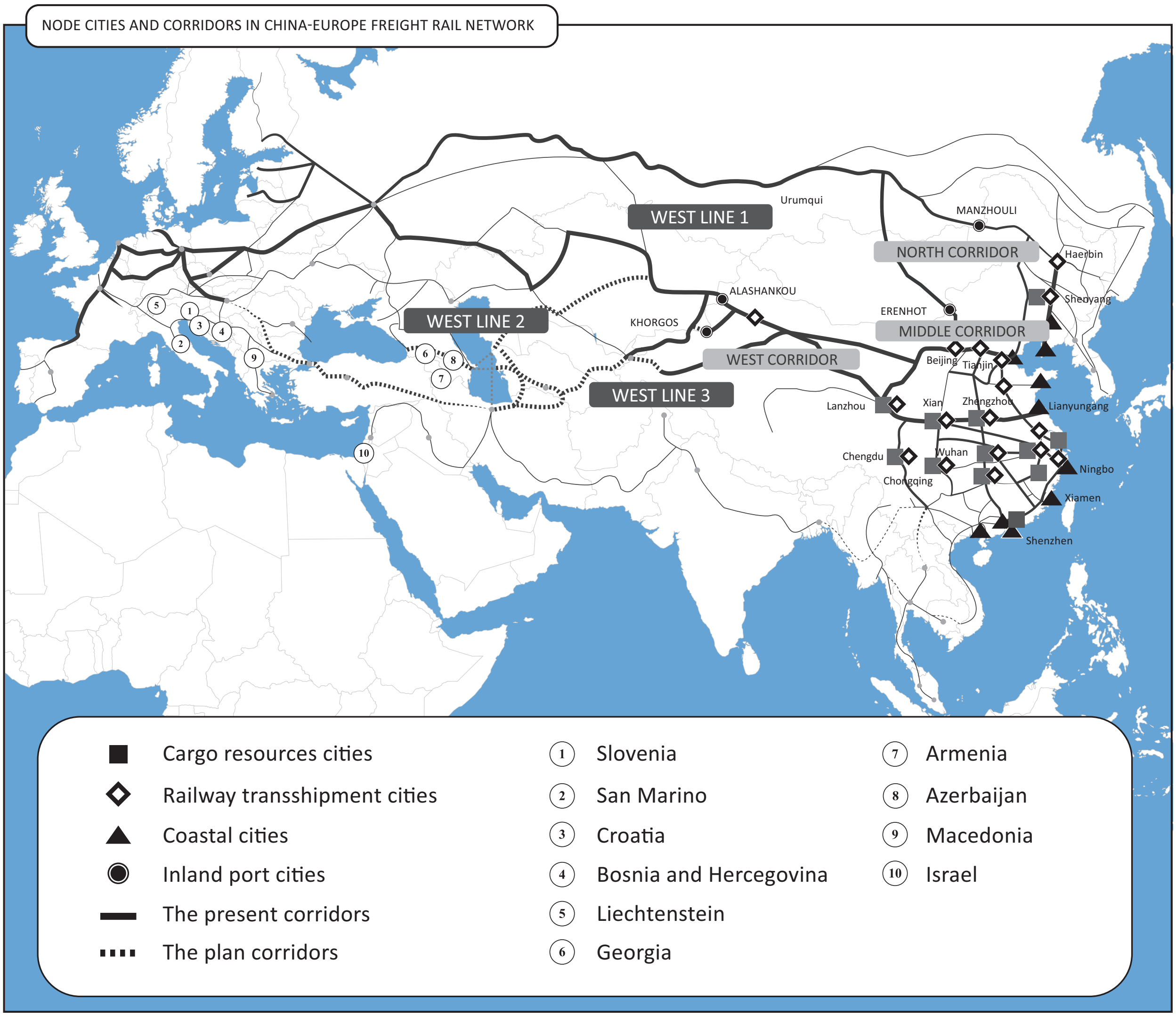
No.	City in China	The border inland port city	The outside city	Direction
1	Chongqing	Alashankou (Khorgos)	Duisburg	Round Trip
2	Chongqing	Manzhouli	Cherkessk	One way
3	Zhengzhou	Alashankou (Khorgos)	Hamburg	Round Trip
4	Zhengzhou	Erenhot	Hamburg	Round Trip
5	Chengdu	Alashankou (Khorgos)	Łódź	Round Trip
6	Wuhan	Alashankou (Khorgos)	Pardubice	Round Trip
7	Wuhan	Alashankou (Khorgos)	Hamburg	Round Trip
8	Wuhan	Manzhouli	Tomsk	One way
9	Suzhou	Manzhouli	Warsaw	One way
10	Suzhou	Manzhouli	Brest	One way
11	Yiwu	Alashankou (Khorgos)	Madrid	Round way
12	Shenyang	Manzhouli	Hamburg	Round way
13	Changsha	Manzhouli	Hamburg	One way
14	Lanzhou	Alashankou (Khorgos)	Hamburg	Round way
15	Beijing Tianjin	Erenhot	Ulaanbaatar	Round way
16	Lianyungang	Alashankou (Khorgos)	Almaty	Round way
17	Yingkou	Manzhouli	Oblast Transbaikal	Round way
18	Qingdao	Alashankou (Khorgos)	Almaty	One way
19	Urumqi	Alashankou (Khorgos)	Almaty	One way
20	Xian	Alashankou (Khorgos)	Almaty	Round way
21	Hefei	Alashankou (Khorgos)	Almaty	One way
22	Jinan	Alashankou (Khorgos)	Almaty	One way
23	Dongwan	Alashankou (Khorgos)	Almaty	One way

Table 1 - Source: Leading Group for Advancing the Development of One Belt One Road (2015)

One of the new additions to the rail infrastructure is the Khorgos Gateway (Infographic 3). A new 300 kilometer railway line offers a second railway link between China and Europe via Kazakhstan, next to the traditional landbridge railway port of entry Alashankou. The remote border town of Khorgos is transformed into a multimodal dryport and industrial zone[8]. Dubai based terminal operator DP World has acted as strategic advisor to the Chinese government in the Khorgos development and the ambition is to develop Khorgos into a new Dubai. In addition to Korgos and Alashankou, the city of Manzhouli acts as a eastern port of entry for the North corridor. Also Erenhot is a port of entry for the Middle corridor via Mongolia.
Table 1 and Infographic 3 present an overview of the current rail lines between China and Europe and Appendix 1 and 2 present the planned node cities, train lines and postal trains for 2016-2020.

[8] Please see https://reconnectingasia.csis.org/analysis/entries/obor-ground/ for more insights

Blueprint of the China-Europe Freight Rail Development Plan



Infographic 3 - Source: SRM on Leading Group for Advancing the Development of One Belt One Road (2015)

Four types of node cities are selected in the China-Europe Freight Rail Construction Development Plan by the Leading Group for Advancing the Development of One Belt One Road (2015) for 2016-2020:

a. *cargo generating cities*: Chongqing, Chengdu, Zhengzhou, Wuhan, Yiwu, Changsha, Hefei, Shengyang, Dongwan, Xian, Lanzhou. These cities will operate shuttle train lines between China and Europe twice per week.

b. *transshipment rail cities*: Beijing, Tianjin, Shenyang, Haerbin, Jinan, Nanjing, Hanghzou, Zhenghzou, Hefei, Wuhan, Changsha, Chongqing, Chengdu, Xi'an, Lanzhou, Urumqi, Ulanqab. These are cities which function as important nodes in the rail transport network between China and Europe.

c. *coastal cities*: Dalian, Yingkou, Tianjin, Qingdao, Lianyungang, Ningbo, Xiamen, Guangzhou, Shengzhen, Qinzhou. These are import cities for the one road transport corridors.

d. the four important *inland port cities* are: Alashankou, Khorgos, Erenhot, Manzhouli.

Because the logistics related to e-commerce has increased sharply, the postal rail lines are attractive for those logistics, the postal rail lines are expected to operating regularly around 2020. In Appendix 2 an overview is presented of the planned postal rail lines between China and Europe. In the far future rail links between China and Europe via Iran and Turkey are expected to be completed (Notteboom, 2016).

Since the 'rail renaissance' between China and Europe started in 2011 and up to June 2016, 1881 train movements were realized and total trade volume was 17 billion USD (Leading Group, 2015). In 2016 market leader Deutsche Bahn (DB) shipped 40,000 TEU per rail from China to the various European countries. DB expects this number to rise to 100,000 TEU by 2020. Adding to the attractiveness are the decreased transit times of trains running from inland China to destinations in Europe. Transit time by rail from Chongqing in inland China to Duisburg (Germany) was in 2014 at the start of the service reported to be 18 days. In 2015 already one day cut from the schedule and in 2017 transit time is somewhere between 14 and 16 days. Chinese estimates expect that there will be 5,000 trains running annually between China and Europe in 2020.[9] These faster transit times allow both for new cargo segments to be carried by rail as for new cities to be added to the network. The Chongqing-Duisburg service has by 2017 expanded into a network where a growing number of Chinese and European cities are connected with regular services. Logistics Service Provider UPS, which has always focused on air freight is now also expanding its rail product. In March 2017 it announced the addition of six more cities to its rail service.[10] Key sales argument is the 65% cost saving that can be achieved when compared to air freight and the 40% transit time saving when compared to traditional ocean freight.

Pricing of the rail product

The rates for sea freight are divided into spot prices and prices fixed by long(er) term contracts. No spot market for transporting rail containers between China and Europe seems to have developed yet. An analysis of statements regarding the price charged to customers yields mixed results.

[9] http://news.xinhuanet.com/english/2016-10/25/c_135780112.htm

[10] UPS Press Release 28-03-2017: 'More cities added in China and Europe enable greater access to alternative shipping options for UPS customers'.

At the 2015 IATA World Cargo Symposium[11] a manager of DB Schenker mentioned a price of USD 8,000 per FEU (Forty Feet Equivalent Unit) for China-Hamburg by train, compared to 3,000 USD/FEU for ocean and 37,000 USD for air freight. The list price for a 40ft high cube container from China to London was mentioned to be at 4,600 USD westbound and 2,500 USD eastbound due to the imbalance in demand. This 4,600 USD was estimated to be half of the price for air freight. On the other hand spot market rates for 40 feet containers between China and Rotterdam were far under 2,000 USD in the spring of 2017.

Products shipped via rail

The launching customer for the rail-service between Chongqing, an urban region in central China, and Duisburg back in 2011 was electronics producer Hewlett Packard (HP). HP started with the production of laptops in Shanghai but moved production further inland, where wages are lower, in 2008. By 2014 one in four laptops worldwide was said to be made in Chongqing.[12] A location further inland means a logistics challenge. Most laptops are not shipped via airfreight because of value/weight ratios. Inland transportation within China is at the moment still relatively inefficient. This created the opportunity for an alternative for traditional ocean freight via one of China's coastal seaports. Already in 2008 the first trails were undertaken and by 2015 more than 4 million laptops had been shipped by rail to European distribution facilities in Duisburg. By 2016 the service also attracted interest of competitors like Apple and Dell[13].

When it comes to the equipment employed on this service the usage of insulated and refrigerated containers should be noted. In order to protect the electronics products from the extreme climates (hot/cold) encountered during the 15 day trip, special equipment is recommended. The usage of reefer containers attracted several new cargo segments which could now be shipped by rail. Containers which would otherwise return empty to China are now increasingly filled with products that used to be flown or shipped to China. One example is (Dutch) milk-powder, for which a premium price is paid in China, and—thanks to the shorter transit times—non-frozen meat.

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[11] http://www.joc.com/international-logistics/china-europe-rail-services-starting-turn-shippers%E2%80%99-heads_20150311.html

[12] http://www.china.org.cn/business/2014-06/16/content_32674371.htm

[13] As stated by a Dutch HP logistics manager in an interview with a Dutch logistics newspaper http://www.nieuwsbladtransport.nl/Nieuws/Article/ArticleID/51256/ArticleName/IntweewekenvanChinanaarDuisburg

Also automotive parts are transported via rail. Another segment that traditionally has been shipped via airfreight are pharmaceuticals. Due to shorter lead times and the aforementioned introduction of temperature controlled containers, up to 10% of refrigerated cargo currently flown between China and Europe could be shifted to rail, experts estimated already in 2015[14]. A recent new commodity to be shipped via the Asia-Europe rail links are parcels and mail. In late 2016 a very first trial run with 139 parcels originating in China destined for persons located around Frankfurt in Germany was shipped via rail.[15] In 2017 a more extensive pilot phase will be initiated. It is interesting to note that these postal services were only made possible after a 1956 ban on international mail transport by rail was lifted.
One of the supply chain risks faced by a rail solution is safety. Several container shuttles are equipped with a special guard carriage for part of the journey where most trouble is expected. A Chinese car dealer organization is using a Europe-to-China-rail shuttle for the parallel import of European luxury cars; the 'reduced risks' were mentioned as an advantage of using rail instead of ocean freight for these imports[16].

Supply chain optimization via rail

The operators of rail shuttles between China and Europe also emphasize on another benefit of the rail shuttles. When a shipment destined for Europe leaves the factory gates too late to be at a seaport in time rail can come in as an interesting solution, instead of expensive air cargo. In the past shippers would have to rely on expensive air freight solutions to get their products in store on time. Rail operators claim they can offer an attractive proposition when such a situation appears. Also in general one of the sales arguments put forward by the rail shuttle operators is the reliability of the service when compared to ocean freight. Market leader DB Schenker mentions 'Stable lead times compared to increased unreliability of Ocean Freight Carriers' in their sales pitch[17].

[14] https://theloadstar.co.uk/coolstar/air-cargo-to-lose-out-as-new-asia-europe-rail-services-cut-transit-times-and-cost/
[15] http://news.xinhuanet.com/english/2016-10/25/c_135780112.htm
[16] Railway Gazette, jun 2016: Cars delivered from Europe to China by rail.
[17] DB Schenker (2015). *Get your business rolling with innovative rail logistics solutions between China and Europe* (sales presentation).

Comparative logistics analysis transport options between China and Europe

To be able to compare rail transport between China and Europe with competing modalities sea and air transport, a logistics analysis has been performed by Van Groningen (2017). The basis of the analysis are the logistics costs of transporting high-tech and high-value industrial products between a location in China and one in Europe. The analysis has been performed for two representative products: first laptops, an example of a high-tech electronics product with a market value of USD 600 and currently being transported by HP by rail, and secondly for high-quality automotive parts, an example is a turbo charger with a market value of USD 1,000. At the moment, BMW is an example of a company using the rail connection. Because of the product characteristics related to laptops and automotive parts, a potential for both rail, sea and air was assumed. For these two products five transport options were selected for the analysis:

1. Rail transport with trucking between Stuttgart and Urumqi.
2. Ocean transport with trucking between Stuttgart and Shenzhen.
3. Air transport (Boeing 777-200F) and trucking between Stuttgart and Shenzhen.
4. Air transport (Boeing 727-200F) and trucking between Stuttgart and Shenzhen and Stuttgart and Urumqi.
5. Unmanned Cargo Aircraft (UCA) between Stuttgart and Shenzhen and Stuttgart and Urumqi.

Urumqi was selected because of its location in Western China and its rail connections to Europe. Shenzhen and Stuttgart are both important markets and global centers of high-tech manufacturing. Production processes located in Shenzhen only make use of ocean transport, production in Urumqi only makes use of the rail option in the analysis. For these three cities, a large industrial park currently in use has been selected. This requires additional trucking from airport, seaport and rail-terminal to the industrial site. The transport options are a wide-body full-freighter, the Boeing 777-200F, and a medium wide-body belly-freighter, the Boeing 727-200F. In addition to rail and ocean transport, an unmanned cargo aircraft (UCA) has been analyzed by Van Groningen (2017). This is an innovative new way of transporting cargo by an unmanned aircraft. An UCA is a sort of freight-drone. Originally drones were designed for (commercial) tasks like science observation and agricultural chemical spraying (Nonami, 2007). In more recent years the use of drones for cargo transport has been subject of several studies (Prent & Lugtig, 2012).

Van Groningen (2017) made a logistics cost function for these different transport options, including cargo costs (warehouse, inventory and handling costs), cost functions for modes used (such as airport/seaport/rail usage, personnel costs, fuel costs, toll costs, depreciation and maintenance costs) based on distance and time travelled. The logistics costs data has been gathered by literature research, the costs of ocean transport is for example based on Van Hassel *et al.*, 2016. Table 2 presents an overview of modes of transport used and travel times and travel distances.

Modes of transport with corresponding travel times and distances on the routes Stuttgart-Shenzhen and Stuttgart-Urumqi

Mode(s) of transport	Stuttgart-Shenzhen		Stuttgart-Urumqi	
	time	distance	time	distance
Rail transport	n/a	n/a	320h03’	Truck: 422km Train: 7007km Truck: 2km
Ocean transport	633h46’ or: 657h46’	Truck: 601km Ship: 18065km Truck: 42km	n/a	n/a
Boeing 777	20h24’ or: 30h24’	Truck: 195km Aircraft: 9307km Truck: 56km	n/a	n/a
Boeing 727	16h08’	Truck: 27km Aircraft: 9307km Truck: 22km	11h13’	Truck: 17km Aircraft: 5932km Truck: 2km
Unmanned Cargo Aircraft	21h23’	9175km	14h53’	5795km

Table 2 - Source: Van Groningen (2017)

Assuming sufficient available demand and a cargo volume of 5 tonnes (automotive parts and laptops), the logistics costs were calculated (Table 3 and 4). By comparing the results of the analysis it is striking that the rail alternative is not the low cost option in terms of logistics costs per turbo charger and laptop. It is surprising that the costs for rail transport and deep-sea transport are roughly the same: USD 25.29 and USD 25.08 for the transport of a turbo charger and USD 15.78 and 15.19 for the transport of a laptop (see Table 3 and 4). This is despite the fact that production in Shenzhen for the sea option is compared to production in Urumqi for the rail option. In addition it is surprising that transport by air (Boeing 777) also is cheaper than the rail and ship option, despite the high transport costs. The high level of inventory transit costs is the main reason for the high costs for the rail service. This is related to the long transit time of 320 hours for rail (13.3 days, see Table 2)—this is a relative short transit time compared to the market information presented before (14-16 days). The transport costs for 5 tonnes of cargo shipped by rail in the analysis of

Van Groningen (2017) are relatively high compared to the USD 8,000 mentioned by Schenker. Another important cost category are the handling costs for LCL-handling of the containers. Although these costs are high for the rail option, they are the same for ocean transport. The costs for the unmanned cargo aircraft are by far the lowest, according to the analysis of Van Groningen, only USD 13.14 and USD 18.60 for a turbo charger and USD 6.06 and USD 9.09 for a laptop, depending on Urumqi or Shenzhen as the production location (Table 3 and 4). Total transport costs for this UCA are relatively high, having in mind that there is no personnel on board of the UCA.

Transport automotive parts China-Europe for different transport options, costs in USD

Stuttgart-Shenzhen **automotive**, fuel USD 1,5/gallon, 5 ton freight, 735 turbo chargers (USD 1,000/unit)							
Mode	Transport costs	Warehouse costs	Inventory transit costs	Handling costs	Total cargo costs	Total logistics costs	Per turbo charger
UCA	9,976	2,088	359	1,254	3,701	13,677	18.60
Boeing777	7,288	2,088	342	6,231	8,661	15,949	21.69
Boeing727	20,712	4,175	271	1,869	6,315	27,027	36.76
Ship	1,566	2,088	11,042	3,743	16,873	18,439	25.08
Stuttgart-Urumqi **automotive**, fuel USD 1,5/gallon, 5 ton freight, 735 turbo chargers (USD 1,000/unit)							
Mode	Transport costs	Warehouse costs	Inventory transit costs	Handling costs	Total cargo costs	Total logistics costs	Per turbo charger
UCA	6,068	2,088	250	1,254	3,592	9,660	13.14
Boeing727	13,507	4,175	190	1,869	6,234	19,740	26.85
Rail	7,390	2,088	5,373	3,743	11,203	18,593	25.29

Table 3 - Source: Van Groningen (2017)

Transport laptops China-Europe for different transport options, costs in USD

Stuttgart-Shenzhen **Laptop**, fuel USD 1,5/gallon, 5 ton freight, 1706 laptops (USD 600/unit)							
Mode	Transport costs	Warehouse costs	Inventory transit costs	Handling costs	Total cargo costs	Total logistics costs	Per laptop
UCA	9,976	2,983	500	2,055	5,538	15,514	9.09
Boeing777	7,288	2,983	477	9,384	12,844	20,131	11.80
Boeing727	29,712	5,967	377	2,812	9,155	29,867	17.51
Ship	1,937	2,983	15,376	5,634	23,994	25,560	15.19
Stuttgart-Urumqi **Laptop**, fuel USD 1,5/gallon, 5 ton freight, 1706 laptops (USD 600/unit)							
Mode	Transport costs	Warehouse costs	Inventory transit costs	Handling costs	Total cargo costs	Total logistics costs	Per laptop
UCA	6,068	2,983	348	1,885	5,216	11,284	6.61
Boeing727	13,455	5,967	264	2,895	9,126	22,581	13.23
Rail	10,683	2,983	7,482	5,790	16,255	26,938	15.78

Table 4 - Source: Van Groningen (2017)

Table 3 and 4 present the base case. Van Groningen also produced some alternative scenarios with respect to higher fuel prices, transit time and scheduling effects and inventory time costs. In these alternative scenario's, the rail option was not becoming more attractive. In a scenario with a reduced depreciation rate, ocean transport even became more attractive.

Based on the research by Van Groningen (2017), the rail option is not very distinctive in terms of total logistics costs. The rail transit time already is low, indicating that the high transport costs of the rail option (USD 7,390 and USD 10,683, see Table 3 and 4) is the main cost category in need of improvement. If these costs could be significantly reduced the rail option certainly would be more competitive. In addition, we assess the transport costs for ocean transport as being low in the analysis of Van Groningen; they may be based on the exceptional market circumstances of highly fluctuating tariffs during 2016. Also, the transit time by sea is (very) low; the 26.4-27.4 days (634-657 hours) of the ocean transport chain do not include time spend at the quay and on the terminal. This might increase the transit time with 6 days of so, very much increasing inventory transit costs in favour of the rail connection. If these 6 days are included, the costs for turbo chargers transported per ship are going up from USD 25.08 to USD 29.17 for the Shenzhen-Stuttgart route. The costs for a laptop are rising from USD 15.19 to USD 18.18—higher than the rail costs of USD 25.29 for a turbo charger and USD 15.78 for a laptop (Table 3 and 4). In the professional press, a time difference of 20 days (480 hours) between the sea and rail option is indicated[18]. In addition, the costs of congestion and unreliable services related to traditional ocean transport are not included in the analysis. Finally, the relation analysed was between China and Germany. If the analysis had been focussed on emerging locations in Central and Eastern Europe and China, the rail option certainly would be much more attractive. But the shipping option also might use the port of Venice as part of the Maritime Silk Road. This would improve the maritime option significantly at the cost of the rail alternative and at the costs of the ports of North-West Europe.

The contribution of Van Groningen (2017) is important in presenting for the first time thoroughgoing research on different modal options between China and Europe. The impact of inventory handling costs also is of much importance in the analysis. The bottom line is that the rail option is a competing alternative. And when referring to the drivers of the OBOR initiative, the logistics advantage of the rail option is only one of the important drivers for the initiative.

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[18] http://automotivelogistics.media/intelligence/china-europe-rail-the-road-less-travelled

International trade and transit of manufactured goods (NSTR9) by value and weight of transported goods (estimation) between Asia and the Netherlands, in billion Euros and kilos and relative shares of total trade volumes, 2015

	value	share	weight	share
	billion euro	%	billion kg	%
Import (total)	65.0	17	5.7	1
Import for domestic use	27.4	12	3.1	1
Import for re-export	37.6	24	2.6	2
Export (total)	22.6	5	1.3	0
Export Dutch products	16.0	6	1.0	0
Re-export	6.6	4	0.3	0
Outgoing transit (total)	19.6	7	1.1	1
Total	97.2		8.1	

Table 5 - Source: Statistics Netherlands, statline

Impact of OBOR on the ports of North-West Europe

The logistics analysis has been performed on high-tech manufactured products; products having a high value-density. This however is only a small part of the total amount of goods transported between the Far East and Europe. In Table 5 the trade between Asia and the Netherlands for ‘automotive, machinery, electrical apparatus and consumer products’ (NSTR 9) is presented for three different types of flows: import/export, re-export and transit. Especially re-export and transit flows are important, because the main origin and destinations of these goods in Europe is the German market. These flows therefore give an indication of broader European demand and may be a potential market for rail transport. An important characteristic of these goods is that they are high in value and low in volume. For example, re-export volumes of these type of goods have a share of 24% of the total value of re-export flows between Asia and the Netherlands, but the share in the volume of re-export goods between Asia and the Netherlands measured by weight is only 2% (Table 5). The total weight of import, export and transit goods between Asia and the Netherlands of manufactured products is 8.1 million tonnes (Table 5); this is 6.4% of the total of containerised cargo handled in the port of Rotterdam in 2015 (126.2 million tonnes). The share of China in total containerised trade between the port of Rotterdam and Asia is 50% and if we assume that 50% of containerised cargo of manufactured products to and from China might shift to rail, this will result in about 2 million tonnes of cargo or about 200.000 containers (TEU) that will not be handled in the port of Rotterdam in the future because of a potential shift to rail; some 1.6% of total containerised cargo handled in the port. For the important ports in North-West Europe in total, this 1.6% means 640 thousand TEU of the total of 40.2 million TEU handled by the top 5 container ports in 2015 (Nightingale, 2017). This is a maximum amount of cargo that will not be handled in the seaport of North-West Europa because of the potential shift to rail, according to our assumptions.

A maximum potential for the shift from ocean cargo to rail of 1.6% of total containerised trade seems not very spectacular. But it has to be seen in the broader perspective of lower growth of global trade and containerised volumes in general since 2011, and of other structural trends that will have an effect of decreasing containerised trade such as more local production patterns because of re-shoring and near-sourcing practises, the impact of the circular economy which is increasing the re-use of existing products, the rise of the sharing economy where the use and the ownership of products are decoupled, demographic factors: on older population in Europe and China is consuming more services instead of products and so on. Also, increased investment in manufacturing facilities in Central and Eastern Europe (Figure 1) will result in new trade patterns towards these growth areas. OBOR is also responsible for an important part of these investment flows (EIU, 2016).

Cross-border manufacturing (jobs created) Europe, 2012-2014

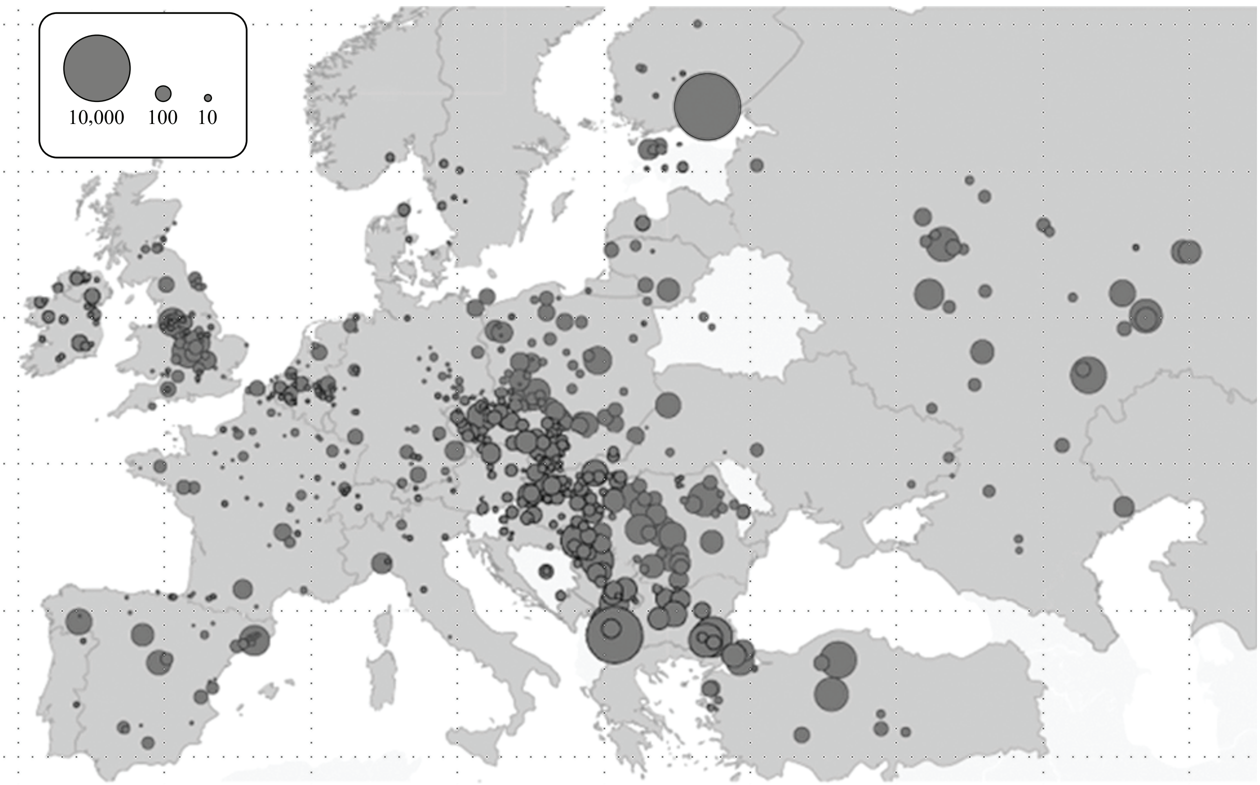


Figure 1 - Source: fDi markets, Financial Times Group 2014

The effect of the modal shift from sea to rail will add up to all those effects. New centres of manufacturing will make use of new entrance ports, such as Piraeus and Venice or Gdansk instead of the ports of North-West Europe. This also is an important effect of OBOR. Haralambides (2017) states that the Mediterranean basin is 'central' in the OBOR network, based on these investment patterns. This will also be a challenge for the ports of North-West Europe and could further reduce volumes. However, in 2016 the largest ports in North-West Europe increased their combined container handling by 1.0%, the Mediterranean ports grew only with 0.4%—despite the strong growth of Piraeus (Nightingale, 2017). In the long run however, this Mediterranean centred strategy around hub ports like Piraeus and Venice might be able to become a strong competitor for North-West European ports, resulting in additional loss of cargo. Especially because new investment patterns, such as illustrated in Figure 1, are not in the traditional hinterland of the North-West European ports, in which Germany is still the centre of gravity. These developments will not become reality in the short run. Like already indicated, OBOR investment is still at a low level. The needed infrastructure to connect the maritime hubs to the hinterland is also slow to materialize. The planned 'China-Europe land-Sea Express' route linking Hungary to the port of Piraeus is, according to the EIU (2016), still in the early stages. Also, new opportunities arise in the ports of North-West Europe, such as serious interest by Cosco Shipping in the planned mega-container facility in the Saeftinghedock in the port of Antwerp[19].

There is a relation between container flows and locational choice for re-export facilities. The warehouses and European Distribution Centres related to the re-export of cargo might also shift to Central and Eastern Europe, because these facilities are relatively footloose (Warffemius, 2007). If seaports will be replaced by inland ports along the New Silk Route, this will also have an effect on employment and value added related to employment in warehouses, logistics chain management and other supporting services. Notteboom and De Langen (2015) estimate a relation between logistics real estate and containerised transport: 50,000 square meters of warehousing space is related to cargo flows of about 3,000-5,000 TEU. The premium container segment that is shifted from deep-sea to rail transport is very much tied to these warehouses and European Distribution Centres (Duprez & Dresse, 2013).

[19] http://www.tijd.be/ondernemen/logistiek/Chinezen-geinteresseerd-in-Saeftinghedok/9846593?ckc=1&ts=1492788301

If the relation between warehouse space and containers used is reciprocal, and 200,000 containers will be shifted toward rail, this might result in 2 million square meters of warehousing decoupled from the strategic link to the seaports and relocation towards Central and Eastern Europe might be considered. Based on an average employment of 27 employees per 10.000 square meters of warehousing (TNO, 2006), this will mean a loss of some 5,000 warehouse workers. In addition, other logistics services are related to these functions, such as transport, IT, legal, finance et cetera. So the total effect might be larger in terms of employment.
OBOR also offers business opportunities in terms of new possibilities for producers in Western Europe for exporting products to the Far East. In the earlier sections we discussed products like car parts and milk powder transported from west to east by rail. In general, new transport infrastructure has usually benefits for regions at both ends of the line.

Strategies by the port authorities of North-West European ports

In the preceding sections we presented four main effects for the large seaports of North-West Europe:

- the loss of China based premium deep-sea cargo shifting to rail and approaching the traditional port hinterland by rail, bypassing the maritime hubs of North-West Europe,
- the loss of distribution facilities and accompanying employment in additional logistics services,
- the shifting hinterland because of investment in Central and Eastern Europe, including OBOR based investment
- the shift of cargo to new hubs in the Mediterranean, like Venice and Piraeus.

Also, the interest of Cosco Shipping to participate in a possible mega-container facility in Antwerp (Saeftinghe) was announced. Offering Chinese logistics firms premium facilities is an important strategy to link carriers and logistics service providers to the ports of North-West Europe. The investment by Cosco in the Euromax ECT terminal in the port of Rotterdam is another example of such an approach. Chinese carriers are not the dominant logistics parties at the moment. Market leaders such as Maersk Line are investing heavily in new technology and IT-infrastructures.

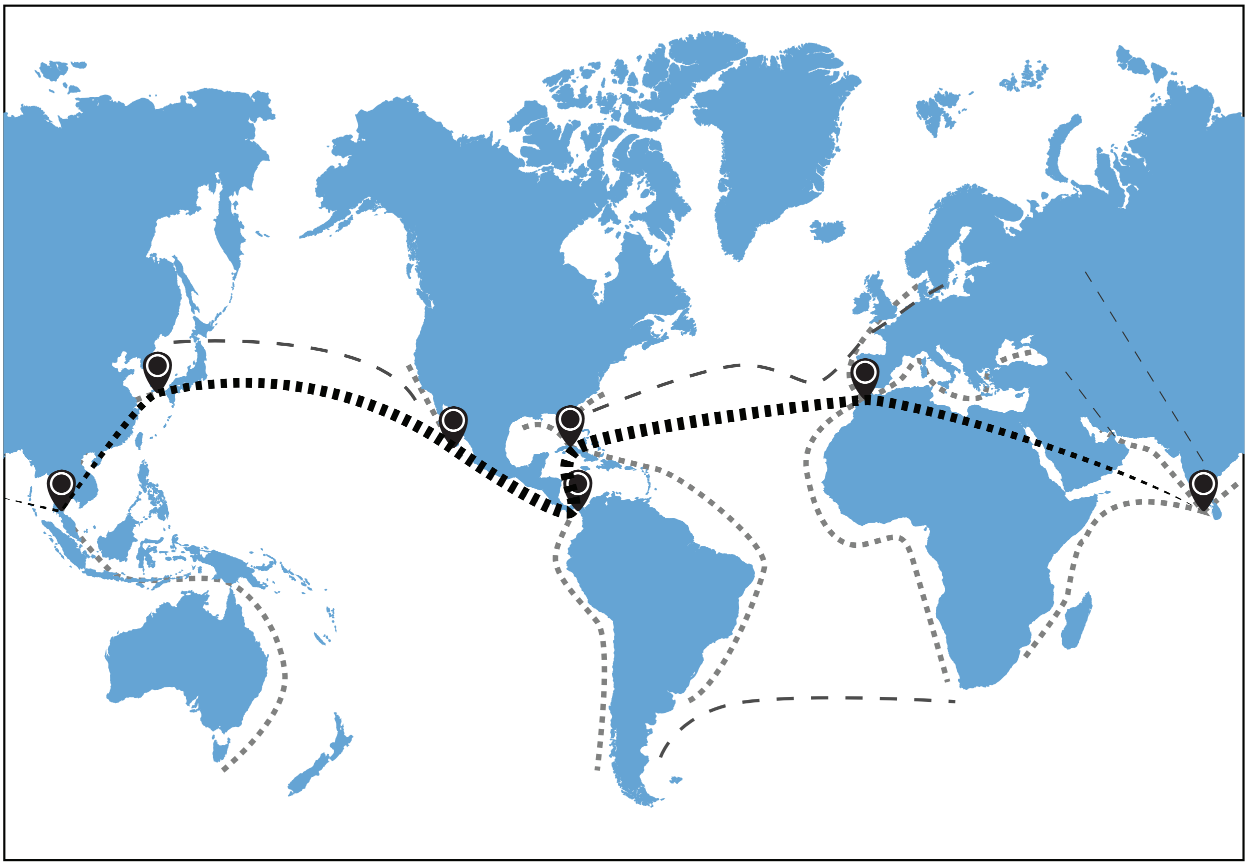
Cosco is part of the Ocean Alliance and is at the moment also dependent on the broader strategies of its alliance members.

Port authorities should concentrate on offering customers the best available port and hinterland infrastructure and services and should develop other important locational characteristics of their ports according to world scale standards. The size of the OBOR initiative is unique and is surpassing other historical projects by far—OBOR is a much bigger effort than the Marshall plan of the late 1940s to fund post-war reconstruction, which had the size of roughly USD 100 billion (in 2016 dollars)[20]. Therefore, individual port authorities lack the power to influence OBOR, even if they join forces.

The TIR Consulting Group (2016) sees additional opportunities for seaports to participate in the building of a digital infrastructure across Eurasia over the next half century, to create a seamless smart Internet of Things platform for carrying out commerce and trade between Chinese ports, such as Shanghai, and the port of Rotterdam. This digital infrastructure is seen as complementing the OBOR initiative. Especially the port of Rotterdam is seen by the TIR Consulting Group as the critical global node that connects the Americas to Europe on the Atlantic Ocean side, while Shanghai connects Asia to the Americas on the Pacific side. This digital global perspective resembles the vision of Haralambides (2017) of OBOR as an Around-the-world Transport Network (Infographic 4). “The Port of Rotterdam can position itself as an aggregator of a digitalized intermodal transportation and logistics platform stretching across Europe and into Asia, fundamentally changing the port’s conception, role, and business model.” This vision by the TIR Consulting Group for the port of Rotterdam, is also seen by the port authority of Hamburg, at the moment co-operating with US tech-firm Cisco in a Smart Port strategy, based on Internet of Things technology.

By investing heavily in these new technological tools, including blockchain technologies, the ports of North-West Europa may stay ahead of the competition of the Mediterranean ports. But the foundation of the port strategies must be based on operational excellence and strategic flexibility and adaptation to new technologies and innovations.

[20] https://www.hongkongfp.com/2016/10/15/hidden-strategic-goals-one-belt-one-road-marshall-plan/



Infographic 4 - Source: SRM on Haralambides (2017)

Conclusion: logistical disruption of the ports of North-West Europe?

In this chapter we presented the OBOR initiative. The most important part of our contribution is the presentation of a logistical analysis of different transport options between China and Europe, including rail. Based on the results of the logistics analysis performed by Van Groningen (2017), we conclude that the rail option is a competitive alternative next to deep-sea and air cargo. In addition, we presented our vision on possible shifts out of the ports of North-West Europe of premium cargo and warehouse space, initiated by the emergence of the rail infrastructure and the emergence of new hubs in the Mediterranean, like Venice and Piraeus, and strong patterns of manufacturing investment in Central and Eastern Europe. However, we do not think that OBOR will be a strong disruption for the ports of North-West Europe. Firstly, the effects presented are relatively small.

However, combined with other effects currently happening, serious negative effects on the growth perspectives of the ports of North-West Europe might occur. Second, the quality of the ports of North-West Europe still is very high when compared to the ports of the Mediterranean. In the ranking of the World Economic Forum (2016), the Netherlands, Belgium and Germany are ranked globally as having the 1st, 6th and 11th best port infrastructure, while Greece and Italy rank number 47 and 56 respectively. So there's a long way to go. Third, the economic co-operation between China and the Central and Eastern European Countries is disappointing with mixed results and modest prospects (EIU, 2016). Also the infrastructural projects are complex and will only show results on the (very) long term. This resembles the experience of Chinese foreign direct investment in Africa (The Economist, 2015). Fourth, the route between China and Europe is complex and the countries that have to be passed are not very stable, both in a political and economic sense. One serious negative event could damage the track record of the rail route. Fifth, the OBOR initiative is too ambitious; the ambition is way too large, goals like the absorption of China's excess industrial capacity are seen as unrealistic (Holland, 2016) and the plan has all the dangers of becoming an additional 'ghost project'. Holland (2016) sees striking similarities with a plan rolled out by Japanese prime minister Keizo Obuchi in the 1990s. Like OBOR, that plan too promised to provide work for Japan's recession-hit construction sector by building Japanese-funded infrastructure projects around Asia. Some infrastructure projects were realized but Holland concludes: "…the reality fell woefully short of Tokyo's grandiose dreams. Far from cementing Japan's economic ascendancy across Asia, the project left a legacy of bad blood, and marked the beginning of a financial retreat from around the region that Japan has only recently begun to reverse."

China has a history of infamous ghost projects and potential bubbles. The real disruption might be the failure of OBOR.

Appendix

Planned trains line for 2016-2020 between China and Europe

No.	City in China	The border inland port city	The outside city	Direction
1	Shijiazhang-Baoding	Alashankou (Khorgos)	Duisburg	Round Trip
2	Erenhot	Minsk	Round Trip	One way
3	Kunming	Alashankou (Khorgos)	Hamburg	Round Trip
4	Erenhot	Rotterdam	Round Trip	Round Trip
5	Guiyang	Alashankou (Khorgos)	Łódź	Round Trip
6	Erenhot	Duisburg	Round Trip	Round Trip
7	Xiamen	Alashankou (Khorgos)	Hamburg	Round Trip
8	Manzhouli	Łódź	Round Trip	One way
9	Korla	Alashankou (Khorgos)	Duisburg	Round Trip
10	Taiyuan	Alashankou (Khorgos)	Brest	One way
11	Erenhot	Almaty	Madrid	Round way
12	Moscow	Round Trip	Hamburg	Round way
13	Nanchang	Alashankou (Khorgos)	Hamburg	One way
14	Erenhot	Almaty	Hamburg	Round way
15	Moscow	Round Trip	Ulaanbaatar	Round way
16	Nanjing	Alashankou (Khorgos)	Almaty	Round way
17	Manzhouli	Almaty	Oblast Transbaikal	Round way
18	Moscow	Round Trip	Almaty	One way
19	Nanning	Erenhot	Almaty	One way
20	Manzhouli	Ulaanbaatar	Almaty	One way

Appendix 1 - Source: Leading Group for Advancing the Development of One Belt One Road (2015)

Planned postal rail lines between China and Europe

The departure city	The inland port city	The outside city
Zhengzhou	Alashankou /Erenhot	Moscow Duisburg Hamburg
Chongqing	Alashankou	Moscow Duisburg Hamburg
Urumqi	Alashankou	Almaty Moscow
Suzhou	Manzhouli	Moscow Duisburg Hamburg
Haerbin	Manzhouli	Moscow

Appendix 2 - Source: Leading Group for Advancing the Development of One Belt One Road (2015)

Bibliography

CASARINI, N. (2016). "When All Roads Lead to Beijing. Assessing China's New Silk Road and its Implications for Europe" in *The International Spectator*, 51:4, 95-108

DUCRUET, C. & ROUSSIN S., JO J.C. (2009), "Going West? Spatial polarization of the North Korean port system" in *Journal of Transport Geography*, 17(5), 357-368

DUPREZ, C. & DRESSE, L. (2013). "De Belgische economie in de mondiale ketens van de toegevoegde waarde. Een verkennende analyse" in *Economisch Tijdschrift*, NBB, September 2013, 7-22

EIU (ECONOMIST INTELLIGENCE UNIT) (2016). *The 16+1: mixed results and modest prospects*, www.eiu.com

ELEN, M. (2015). "China's Silk Road initiatives could shake up European port cities' status quo" in *China Economic Review*, 8th September 2015

EUROPEAN PARLIAMENT (2016). "One Belt, One Road (OBOR): China's regional integration initiative" in *Briefing*, July 2016. http://www.europarl.europa.eu/RegData/etudes/BRIE/2016/586608/EPRS_BRI(2016)586608_EN.pdf

FERDINAND, P. (2016). "Westward ho—the China dream and 'one belt, one road': Chinese foreign policy under Xi Jinping" in *International Affairs*, 92(4), 941-957

HARALAMBIDES, H.E. (2017). "One-Belt-One-Road (OBOR), China-EU trade relations, and (geo)political positioning statements" presentazione all'*Intermodal Asia 2017*, 22-23 Marzo 2017, Shanghai, P.R. China

HAYUTH, Y. (1987). *Intermodality: concept and practice*, Lloyd's of London Press Ltd., London

HICKOK, M.R. (2000). The other end of the Silk Road: Japan's Eurasian initiative. Central Asian Survey, 19(1), 17-39

HINTJENS, J., VANELSLANDER, T., VAN DER HORST, M. & KUIPERS, B. (2015). "The evolution of the economic centre of gravity and the consequences for gateway ports and hinterland connections: the case of the Flemish-Dutch Delta", proceedings of the *IAME Annual Conference 2015*, International Association of Maritime Economics

HOLLAND, T. (2016). "Why China's 'One belt, one road' plan is doomed to fail" in *This Week in Asia*, 6th August 2016

Johnson, C. (2016). *President Xi Jinping's "Belt and Road" Initiative A Practical Assessment of the Chinese Communist Party's Roadmap for China's Global Resurgence*, Washington DC: CSIS

Leading Group for Advancing the Development of One Belt One Road (2015). *The China-Europe Freight Rail Construction Development Plan 2016-2020*, National Development and Reform Commission, Beijing

Len, C. (2015). "China's 21st Century Maritime Silk Road initiative, energy security and SLOC access" in *Maritime Affairs: Journal of the National Maritime Foundation of India*, 11(1), 1-18

Lin, C. (2011). "China's new silk road to the Mediterranean: the Eurasian land bridge and return of Admiral Zheng He", *ISPSW Strategy Series*, 165

Lloyd's List (2017). *Europe to Asia ocean freight disruptions set to go on for several more weeks*, 12th April 2017

Luft, G. (2016). "China's Infrastructure Play: Why Washington Should Accept the New Silk Road", *Foreign Affairs*, 95(5), 68

Maloni, M., Paul, J.A. & Gligor, D.M. (2013). "Slow steaming impacts on ocean carriers and shippers", *Maritime Economics & Logistics* (2013) 15, 151–171

Nightingale, L. (2017). "Box Port Majors report moderate 2016 growth", *Containerisation International*, April 2017, 32-38

Nonami, K. (2007). "Prospect and Recent Research & Development for Civil Use Autonomous Unmanned Aircraft as UAV and MAV", *Journal of System Design and Dynamics*, Vol. 1, No 2, pp. 120-128

Notteboom, T. (2016). "One Belt, One Road and hundreds of European ports: How the OBOR policy might affect European port-hinterland dynamics". Presentation for the *ESPO Conference 2016*, Dublin, 1st June 2016

Notteboom, T. & de Langen, P.W. (2015). "Container port competition in Europe" in Lee, C.Y. & Meng, Q. (Eds), *Handbook of ocean container transport logistics*, Springer, 75-95

Otsuka, S. (2001). "Central Asia's Rail Network and the Eurasian Land Bridge", *Japan Railway & Transport Review*, 28, 42-49

Poeth, G.G.J.M. & van Dongen, H.J. (1983). "Rotterdam of de Noodzaak van een Infrastructuur voor Informatie" (Rotterdam or the Necessity of an Infrastructure for Information)., Openbaar Lichaam Rijnmond, Rijnmond

Prasad, E.S. (2015). “The Path to Sustainable Growth in China”, presentazione Brookings Institute, *U.S.-CHINA Economic and Security Review Commission Hearing* in *China ahead of the Thirteenth Five-Year Plan: Competitiveness and Market Reform*

Prent, S. & Lugtig, J. (2012). *Onbemande vrachtvliegtuigen: Kosten-analyse*, Enschede, 11th May 2012

Prologis-eft (2016). *Themes shaping new location selection in Europe*, Prologis, San Fransisco

Shu, X. (1997). “The new Asia-Europe land bridge–current situation and future prospects”, *Japan Railway and Transport Review*, 14, 30-3

Tate, W.L., Ellram, L.M., Schoenherr, T. & Petersen, K.J. (2014). “Global competitive conditions driving the manufacturing location decision”, *Business Horizons*, 57(3), 381-390

Tavasszy, L., Minderhoud, M., Perrin, J-F. & Notteboom, T. (2011). “A strategic network choice model for global container flows: specification, estimation and application”, *Journal of Transport Geography*, 19 (2011) 1163–1172

The Economist (2015). *Not as easy as it looks*, 21st November 2015

The Economist (2016). *Our bulldozers, our rules*, 22nd July 2016

TNO (2006), *Verkennend onderzoek geluid versus economie in de zeehaven van Dordrecht*, TNO Mobiliteit en Logistiek, Delft

TIR Consulting Group (2016). *The Third Industrial Revolution Roadmap Next Economy for The Metropolitan Region of Rotterdam and The Hague*, Bethesda, MD, USA, TIR Consulting Group LLC

Van der Putten, F.P. (2014). *Chinese investment in the port of Piraeus, Greece: The relevance for the EU and the Netherlands*, Clingendael Institute

Van Hassel, E., Meersman, H., Van de Voorde, E. & Vanelslander, T. (2016), “Impact of scale increase of container ships on the generalised chain cost” in *Maritime Policy & Management*, 43:2, 192-208

Van Groningen, R. (2017). *Cost Benefit Analysis Unmanned Cargo Aircraft: Case Study Stuttgart - Urumqi/Shenzhen*, Master’s Thesis Erasmus University Rotterdam

Vellenga, D.B. & Spens K.M. (2006). “Expansion of container traffic from Asia to the EU Contemporary Research Issues” in *International Railway Logistics*. Research Report, 171, 111-118

Warffemius, P.M.J. (2007). *Modeling the Clustering of Distribution Centers around Amsterdam Airport Schiphol location endowments, economies of agglomeration, locked-in logistics and policy implications*, TRAIL research school, Delft

World Economic Forum (2016). *The Global Competitiveness Report 2016–2017*, World Economic Forum, Geneva

Zhao, H. (2012). “China–Myanmar Energy Cooperation and Its Regional Implications” in *Journal of Current Southeast Asian Affairs*, 30(4), 89-109

maritime economy