New Silk Road – The golden middle way

Faster than sea freight, cheaper than air
China is investing billions in trade routes with the West. As well as sea and air transport, the New Silk Road is creating new options for rail transport between China and Western Europe. For many shippers, their choice of transport has not really been a topic of discussion for a long time, but this development makes it interesting to reconsider supply chains.

The New Silk Road is still in its early days, although it is developing rapidly. What does the Silk Road have to offer? In which situation and for which products is the Silk Road interesting? We used desk research and interviews to provide answers in this publication.

1 | New Silk Road – the golden middle way between sea and air
   Three main routes enriching the logistics world
   Rail represents the middle ground between sea and air

2 | New options for shippers
   Transport modality choice mainly concerns speed and costs
   Silk Road favourable from and to hinterland locations
   Train much more climate-friendly than airplane
   Most promising for more higher valued consumer products
   The Silk Road will become a fixed value multi-modal option

Attachment: The Silk Road from door to door

Colophon
Conclusion

New silk railroad mainly competes with air freight

New Silk Road is mainly a cheaper and greener alternative to air transport

The New Silk Road offers opportunities for shippers of relatively expensive consumer products and semi-manufactured goods. Rail is a faster alternative for time-sensitive products that are currently transported by sea but mainly competes with the considerably more expensive air transport. Airports such as Schiphol, Frankfurt and Luik, but also in central Europe may lose cargo to rail because of this. Moreover, CO₂ emissions of freight between China and Northwest Europe can be twenty times lower. Compliance with the Paris Climate Agreement and more pressure from customers will ensure that this carries more weight in the future.

Door to door thinking and combinations important

To compare the options between China and Northwest Europe, it is important that shippers look further than from port to port. Substantial pre and on-carriage transport is often required. This makes the Silk Road particularly attractive for inland departure points and destinations in Europe and China.

A complete switch to rail is generally not attractive or feasible for large shippers because of the capacity. This switch mainly relates to cheaper combinations with air and or sea freight.

Challenges ahead, but Silk Road is here to stay

The Silk Road is on the way to completion. Without Chinese subsidies, the connection would lose is competitiveness, but efficiency improvements and scale advantages can result in faster transport and lower costs and rates. The crowded rail network in Northwest Europe is a challenge to growth. Nevertheless, the Silk Road has lots to offer and will have a permanent place in the range of options.

Silk Road ‘golden middleway’ in speed and price

Comparison of Silk Road as alternative to sea and air transport

<table>
<thead>
<tr>
<th>Speed</th>
<th>Price</th>
<th>CO₂ emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air</td>
<td>Relatively high</td>
<td>High</td>
</tr>
<tr>
<td>5 - 8 days</td>
<td>Relatively low</td>
<td>Low</td>
</tr>
<tr>
<td>15 - 25 days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35 - 55 days</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*The timing of arrival by rail and sea transport is less predictable than with air transport. The pre and on-carriage transport and the number of departures per week and freight size influence the final duration.

**Concerns CO₂ emissions without pre and on-carriage transport.
Chapter 1  |  New Silk Road - golden middle way between sea and air

1.1 Three main routes enriching the logistics world  
1.2 Rail represents the middle ground between sea and air
The New Silk Road introduced

1.1 Three main routes enriching the logistics world

**Eurasian Land Bridge offers new opportunities**
There is an increasing focus on the New Silk Road by rail between China and Europe. The first trains started running in 2011, and the number has increased rapidly in recent years. The connection is part of the Chinese government’s long-term Belt and Road Initiative (BRI), which uses a broad and multi-modal investment programme to focus on strengthening trade relations and reducing trade and transport costs. Until now, the natural choice for shippers was air or sea freight. Rail has added another option to this.

**Volumes are still low, trade value is higher**
Transport between China and Europe over the three main routes amounted to 200,000* TEU** in refrigerated and other containers in 2017. The expectation is that the volume will continue to grow into double figures across Europe in the coming years. In volume, this concerns just 1-2% of the total supply chain between China and the EU of approximately 15 million TEU, but due to the high-grade goods, the trade value is higher.

**Chinese and European hinterland more accessible**
A big advantage of the Silk Road is the opening up of the Asian and European hinterland. The most important expansion is appearing in Asia, with Khorgos in Kazakhstan as central transhipment point and gateway. Countries in Central Europe, including Poland, the Czech Republic and Hungary are also more accessible.

*Source: UIC and Kazakhstan railways, **TEU: twenty foot equivalence unit

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*There were over 50 departures and arrivals per week in 2017 from Duisburg (largest European hub) to over 10 Chinese cities (indirectly over 40). In the Netherlands, Tilburg and Amsterdam are directly connected.*

*From Northwest Europe, it is mainly the northerly routes that are used; route 2 is currently the busiest.*

*The main Poland-Belarus border (Malaszewicze) is a bottleneck (because of customs, track gauge change and a bridge), but investments are reducing this delay.*

*China is making considerable investments in the Port of Piraeus, which is now growing rapidly and may have a connection to the rail routes in the future.*

*Transport does not necessarily need to cover the entire Silk Road from end to end.*

*Transport takes place almost entirely using containers. Because of the large temperature differences, this often also involves refrigerated containers.*

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ING Economics Department

New Silk Road – The golden middle way – February 2019
The Silk Road option compared to sea and air

1.2 Rail represents the middle ground between sea and air

Faster than sea freight, cheaper than air freight

Compared with rail transport (Silk Road) and air transport, sea transport has considerable economies of scale advantages. Vessels are increasing in size and there is more than sufficient capacity. This significantly reduces costs per container, making sea freight very competitive. A disadvantage is that significant pre and on-carriage transport is needed from the ports. With the wider introduction of *(super) slow steaming**, sea transport is likely to become slower rather than faster. Shippers cannot always afford longer lead times. Air transport, on the other hand is fast, but expensive. In addition, the CO₂ emissions from air freight are much higher than those of rail transport and sea freight. Transport across the Silk Road takes the middle ground between sea and air freight, in terms of costs as well as duration. This offers new opportunities in logistics.

<table>
<thead>
<tr>
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<th>Price</th>
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*The timing of arrival by rail and sea transport is less predictable than with air transport. The pre and on-carriage transport and the number of departures per week and freight size influence the final duration.

**'(super) slow steaming’

Capacity has its influence on price and flexibility

The capacity of the modalities varies widely:

- New large containership over 20,000 TEU
- Train 84 TEU
- Boeing 777 freighter 6-16 TEU

This difference in scale affects the transport price. Sea and air transport are also much more tied to fixed locations than rail transport. The number of departures per week also determines the flexibility of the transport and influences the transit time.
Chapter 2  |  New options for shippers

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2.3 Train much more climate-friendly than aeroplane 10
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Modality selection

2.1 Transport modality choice mainly concerns speed and costs

Shipper chooses, logistics partner is coordinator
The decision regarding modality choice for transport from China to Europe or vice versa usually lies with the shipper. Logistics service providers generally act as coordinator ("control tower") of the supply chain (see attachment).

Three criteria play a role in selecting the modality
In choosing a modality, the product being transported is the starting point. Looking at the product features, the most important decision criteria are:
1. Speed (page 9)
2. Transport costs (page 9)
3. CO$_2$ emissions* (page 10)

Costs are important, but speed can take priority
Transport is a cost-driven activity, so rates are important. These costs differ per modality and also depend on distance and weight. However, time also has a price, as products are en route and this goes hand in hand with capital costs. After all, working capital is used for the delivery period, and this makes products time-sensitive. Speed is essential in:
- Products with a high value per kilogram
- Fashion or seasonal products (such as clothing)
- Project cargo (with specific timing)
- Perishable products (such as flowers)
- Products in which a customer pays for speed (as with e-commerce)

The consideration of transport options starts, therefore, with the desired speed. If this is flexible, because of relatively low capital costs and plannable deliveries, then the transport costs are generally decisive.

Modality choice is not always self-evident
Sometimes the transport choice is obvious. For example, a light freight that is worth millions of euros.

Or a freight that has little value and can be delivered from stock. Smartphones and expensive medicines will, for example, mostly be transported by air freight, while promotional items will go by sea. However, choices are not always black & white. For a large number of products, the choice is not necessarily always the same and depends on specific circumstances.

Product features (including value) are the starting point for the decision process
Basic decision route for transport options

Shipper examines transport options based on the features of goods (including value per kilogram)

First choice based on (1) speed - How time-sensitive is the delivery?
Other choice based on (2) transport costs** and (3) CO$_2$ emissions

*CO$_2$ emissions play a role, but the preparedness to pay for this is currently low. In the future, it is expected that this will become more important following pressure from purchasers or regulations flowing from the Paris Climate Agreement. **Up to a weight of 167 kg per m$^3$ a minimum price applies that is used for calculations. This makes transport costs for volume goods with relatively little weight, such as flowers, extra high.
Competitive position of New Silk Road

2.2 Silk Road favourable from and to hinterland locations

Sea transport competitive, but requires additional transport
Ships are the cheapest option for transport between China and Western Europe, but these are tied to sea ports. Pre and on-carriage transport from the supplier to the port or from the port to the customer makes sea transport more expensive from door to door. With the shift in production to the Chinese hinterland, this can play a more significant role.

Long hinterland transport in China favours train
Calculating the pre and on-carriage transport is important in making a balanced decision. For instance, transporting cargo from Chengdu in the Chinese hinterland to the sea port of Shanghai or vice versa amounts to some 2,000 kilometres. This takes about five days by truck and results in substantial increases in total transport price. This makes transport and capital costs from Chengdu to Tilburg or Duisburg, when totalled, comparable with those of rail.

Capital costs important factor for more expensive shipments
Capital costs are not always included in cost calculations by shippers. Particularly for more expensive goods, every day in transport makes the delivery more expensive. This can make the Silk Road an attractive option compared with sea transport, which takes twice as long.

Aeroplane four to six times as expensive as train
Aeroplanes remain considerably more expensive than rail or vessel up to a value of hundreds of euros per kilogram of goods, including capital costs. For instance, air transport from a Western European airport to Chengdu is four to six times as expensive.

Rail transport does not need to be more expensive than sea freight from and to the deep hinterland
Indication of total costs of transport between Northwest Europa and Chengdu in the Chinese hinterland*

<table>
<thead>
<tr>
<th>Goods with a low value (€40,000)*</th>
<th>Goods with a high value (€600,000)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital costs</td>
<td>Costs of pre and on-carriage transport</td>
</tr>
<tr>
<td>Transport costs of the main modality</td>
<td>Transport costs of the main modality</td>
</tr>
</tbody>
</table>

*Stating point of example: a 40-foot container from supplier to purchaser, capital costs 5%, weight 12,000 kg. Transport costs including pre and on-carriage transport and subsidy: sea transport €3,000, Silk Road €4,000 (including subsidy) and air transport €2.20 per kilogram. In practice, the costs vary from case to case, partly because of: different origin and destination locations, price difference in transport direction, different rates and subsidies per Chinese city/region, differences in frequency of transport and whether a standard or reefer container needs to be hired. Up to approximately 12,000 kg a minimum price per m³ applies to air freight. If the freight is heavier, air freight becomes more expensive per kg.
Differences in CO₂ footprint

2.3 Train much more climate-friendly than aeroplane

Sustainability costs cannot be high, but are becoming a factor of interest

Speed and price are the most important factors for the modality choice. In general, shippers are not yet prepared to pay for green. However, CO₂ emissions are linked to an increasing CO₂ price, and the increased pressure from shippers to reduce emissions will play a more important role. This mainly applies to shippers of consumer goods such as fashion or high-quality foodstuffs.

Silk Road much more climate-friendly than air freight

Assuming a freight of 12,000 kg, transport over the Silk Road emits almost 20 times less CO₂ than air transport. From port to port, the emission per container of sea transport is lower than rail because of the huge economies of scale of megaships on the East-West route. Long pre and on-carriage transport by truck - in our example between Shanghai and Chengdu - cancels this out, which means that there’s not much difference between the two.

CO₂ price will impact the future transport price

It is expected that, by limiting emissions, the CO₂ price will have more impact on transport prices in the future. If the CO₂ market price increases by, for instance, €20 to €40 per tonne, this means that air transport in this example will represent €1,000 in CO₂ rights. If the transport is not pre-determined, this can offer additional incentives to assess whether (part of) the air freight can be transported by rail.

CO₂ emissions already costed in air transport, but not yet in shipping and rail

A global ‘carbon offsetting’ system (CORSIA) will be introduced from 2021 that aims to fix the total emissions at the 2020 level. No CO₂ trade systems or taxes apply as yet to shipping and rail.

Much lower CO₂ emissions than air freight can support choice for Silk Road

Emissions for transport of container freight Northwest Europe – Chengdu* in tonnes CO₂

Source: CO2-emissiefactoren.nl, UN/UNEP-DTU

*Starting points; air: Shipping-Chengdu + regional on-carriage transport per truck, and rail: Tilburg-Chengdu + regional on-carriage transport per truck, sea: Port of Rotterdam-Shanghai + on-carriage transport per truck from or to Chengdu (2,000 km). Weight: 12,000 kg
**2.4 Most promising for more expensive consumer products**

**Raw materials continue to be transported over sea**

Because of the large-scale available capacity and economy of scale advantages, in the future by far the largest number of goods between China and Europe will be transported by sea. For bulk goods such as oil products, ores, agribulk and biomass, this will continue to be the most efficient. This is also true of cheaper consumer products. This will limit the expected negative impact of the Silk Road on the Ports of Rotterdam and Antwerp.

Based on three criteria, we can determine which type of products from the European trade package lend themselves (depending on the destination) to transport via the Silk Road:

1. The transport is permitted*
2. The product has sufficient value**
3. The product is time-sensitive (see 2.1)

**Most promising for transport of consumer goods**

Mainly consumer products and semi-manufactured goods are suitable for the Silk Road. **Westbound** (from east to west) mainly products such as electrical equipment (including laptops and TV screens), clothing and toys are transported. As by sea, the utilisation rate is higher from east to west than in an easterly direction.

**Eastbound** (from west to east) mainly products such as machines, car parts, medicines, cosmetics and milk powder are transported. More expensive foodstuffs such as wine and fish products are also promising. Such things as meat and cheese are excluded for the northern routes because of the European Russian trade embargo.

**Considerable imbalance in east-west supply chain**

**Relevant supply chains*** 2016

- **Europe**: €345 billion, 88% of total
- **China**: €117 billion, 70% of total

Source: World bank, ING Economics Department

*Chemicals may still be transported by rail from/to China; for transport through Russia restrictions apply.

**Minimum €3 per kg, resulting in 7% transport costs for €4,000 (incl. subsidy) per 40 foot container and 20,000 kg content.

***Permitted goods with a value from €3 - €200 per kg that could be eligible for the Silk Road.

**Westbound (from east to west) mainly suitable for electrical equipment and clothing**

Share in the value of Silk Road-suitable product categories in the relevant European goods export (EU 27)

<table>
<thead>
<tr>
<th>Product Category</th>
<th>0%</th>
<th>10%</th>
<th>20%</th>
<th>30%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elec. equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clothing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toys</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Furniture</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shoes</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Eastbound (from west to east) mainly suitable for electrical machinery and cars.**

Share in the value of Silk Road-suitable product categories in the relevant European goods export (EU 27)

<table>
<thead>
<tr>
<th>Product Category</th>
<th>0%</th>
<th>10%</th>
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<tbody>
<tr>
<td>Elec. machinery</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car parts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pharmaceutical products</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metal products</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cosmetics</td>
<td></td>
<td></td>
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<td></td>
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</tbody>
</table>

Source: World bank, ING Economics Department
New Silk Road still in development
The New Silk Road is on the way to completion. There are opportunities for shippers but also challenges such as the bottleneck at the Poland-Belarus border. The time-loss at customs checks and different safety systems and voltages on the track also play a role. By investing in bottlenecks, opening alternative routes, scaling up the frequency and commitment of countries such as Poland and Kazakhstan, it is expected that the lead time will be reduced.

Growth potential as well as uncertainties
That the New Silk Road has potential is clear. However, there are two uncertainties that can impact the growth tempo for Northwest Europe:

• Silk Road is dependent on subsidies
The business case still relies strongly on Chinese subsidies. The subsidies differ per city/region, but this concerns substantial amounts per 40-foot container. Considering the Chinese long-term horizon, the subsidies appear to be assured for the coming years, but whether the subsidies will remain intact in the coming decades is unclear. Scale and efficiency advantages must compensate for the subsidies in the future.

• Western European rail road capacity is limited
The Western European rail network is crowded, and passenger trains often take priority. The Betuweroute in the Netherlands is, for example, regularly at its current capacity limit of 110 trains per direction per day, which will be increased to 160 per direction per day in 2023. The railway-system is also crowded in Germany and Belgium. Investments in European infrastructure are complex, and capacity expansion can take some ten to twenty years. However, in central and Eastern European countries the rail network offers more space and cities like Budapest are interested in becoming a ‘railhub’.

Silk Road can poach cargo from air freight
Considering the huge price difference and the transported products, the Silk Road is expected to mainly compete with air freight. Products that this could impact include medicines, electronics and flowers. Western European airports such as Frankfurt and Schiphol may begin to notice this in the longer term. Schiphol has traditionally focused strongly on Asia (a fifth of the freight comes from China and Hong Kong). For Frankfurt the Far East is the largest market as well.

Multi-modal combinations are the future
One modality does not cancel out another. In practice, combinations of rail with air transport and/or sea transport are an appropriate solution for large shippers. This can, for example be realised by supplying goods in a phased way or by making a distinction per customer or per product. This also spreads the risks. The Silk Road also offers opportunities for more optimum servicing of supply chains via a multi-modal mix.

Arctic sea route presents no extra competition
In the summer of 2018, a Maersk vessel made a test sail to Asia over the top through the Russian Arctic. This route is supposed to reduce the duration of transport between Europe and Asia by 40%. The route will, however, only be sailable for three months of the year, and then only in special vessels. For now, this will not make shipping much more attractive than is now the case.
The New Silk Road in practice

Interested parties often ask themselves who does what throughout the entire logistics process of the Silk Road. How exactly does transport on the Silk Road work? An example for Northwest Europe - Chengdu is given below, with an indication of the duration and distribution.

<table>
<thead>
<tr>
<th>Location</th>
<th>Transportation</th>
<th>Duration</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>Rail</td>
<td>2 days</td>
<td>1,500 km</td>
</tr>
<tr>
<td>Belarus</td>
<td>Road</td>
<td>2 days</td>
<td>5,300 km</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>Rail</td>
<td>5 days</td>
<td>2,800 km</td>
</tr>
<tr>
<td>China</td>
<td>Rail</td>
<td>3 days</td>
<td></td>
</tr>
<tr>
<td>Chengdu</td>
<td>Road</td>
<td>2 days</td>
<td></td>
</tr>
</tbody>
</table>

**Total duration:** 10 days

**Additional steps:**
- Considering the transport options
- Organise the transport including pre and on-carriage transport (knowledge of suitable routes)
- Combine transport (and larger purchases)
- Arrange the (local) customs formalities
- Arrange containers
- Insure the transport
- Arrange track & trace