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LOGISTICS PROCESSES ON EURO-ASIAN TRANSPORT LINKS

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LOGISTICS PROCESSES ON EURO-ASIAN TRANSPORT LINKS

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ABSTRACT

Five years ago, in September 2013, the Chinese government proposed one of the largest infrastructure and investment projects in history, the Belt and Road initiative (BRI), aspiring to strengthen the connections between Asia and Europe with significant focus on logistics and transportation infrastructure development. This research aims to investigate the development of logistics processes on Euro-Asian transport links and to provide a comprehensive understanding on the extent to which this initiative has affected the logistics processes between Europe and Asia. The study may be defined as an exploratory research with inductive approach employing the strategy of ground theory. Both quantitative and qualitative data have been analyzed and presented in a linear and logical progression to enable a comprehensive understanding of the subject. Since logistics demand derives from the demand for goods, the research analyzes Euro-Asian trade over the past decade, identifying trends and interpreting shifts. Furthermore, the study raises knowledge of most prominent logistics developments under the scope of the BRI using case studies of significant projects, and presents findings on how the logistics processes between Europe and Asia have been affected. Within a limited period of time since the initiative was first announced and despite the fact that the majority of the development projects under its scope are still under their development phase, it becomes apparent that the BRI has the potential to fully reshape the logistics landscape of the Eurasian continent.

ΕΚΤΕΝΗΣ ΠΕΡΙΛΗΨΗ

Πριν από πέντε χρόνια, τον Σεπτέμβριο του 2013, η κυβέρνηση της Κίνας πρότεινε ένα από τα μεγαλύτερα έργα υποδομής και επενδύσεων στην ιστορία, την πρωτοβουλία Belt and Road (BRI), που επιδιώκει να ενισχύσει τη διασύνδεση της Ασίας και της Ευρώπης με ιδιαίτερη έμφαση στην ανάπτυξη υποδομών logistics και μεταφορών. Η έρευνα αυτή αποσκοπεί στη διερεύνηση της εξέλιξης των διαδικασιών της εφοδιαστικής αλυσίδας στην ευρω-ασιατική ήπειρο και στην πλήρη κατανόηση του βαθμού στον οποίο αυτή η πρωτοβουλία επηρέασε τις διαδικασίες αυτές μεταξύ της Ευρώπης και της Ασίας. Η μελέτη μπορεί να οριστεί ως διερευνητική έρευνα με επαγωγική προσέγγιση που χρησιμοποιεί τη στρατηγική της εμπειρικά θεμελιωμένης θεωρίας. Τόσο ποσοτικά, όσο και ποιοτικά δεδομένα έχουν αναλυθεί και παρουσιάζονται με γραμμική και λογική εξέλιξη, ώστε να καταστεί δυνατή η ολοκληρωμένη κατανόηση του θέματος. Δεδομένου ότι η ζήτηση για υπηρεσίες logistics απορρέει από τη ζήτηση για αγαθά, η έρευνα αναλύει το εμπόριο μεταξύ Ευρώπης και Ασίας κατά την τελευταία δεκαετία, προσδιορίζοντας τις τάσεις και τις μεταβολές. Επιπλέον, η μελέτη προσφέρει γνώση σχετικά με τις σημαντικότερες εξελίξεις στην ανάπτυξη έργων υποδομής και υπηρεσιών logistics υπό το πεδίο εφαρμογής του BRI, χρησιμοποιώντας μελέτες περιπτώσεων σημαντικών έργων και παρουσιάζει πορίσματα σχετικά με τον βαθμό στον οποίο έχουν επηρεαστεί οι διαδικασίες logistics μεταξύ Ευρώπης και Ασίας.

Το κύριο ερευνητικό ερώτημα της παρούσας εργασίας έχει αναπτυχθεί ως εξής:

Πώς έχει επηρεάσει η πρωτοβουλία Belt and Road τις διαδικασίες logistics μεταξύ Ευρώπης και Ασίας;

Επιπλέον, προκειμένου να δοθεί απάντηση στο κύριο ερευνητικό ερώτημα, έχουν καθοριστεί τέσσερις υπο-ερωτήσεις:

- Έχει μεταβληθεί το εμπόριο μεταξύ Ευρώπης και Ασίας μετά την ανακοίνωση της πρωτοβουλίας BRI;
- Έχει αυξηθεί ή μειωθεί η διακίνηση αγαθών στις εμπορευματικές διαδρομές μεταξύ Ευρώπης και Ασίας;
- Υπάρχουν σημαντικές επενδύσεις σε έργα υποδομής που αφορούν στην εφοδιαστική αλυσίδα και ποιοι είναι οι κύριοι τομείς εστίασης;
- Ποιες είναι οι τρέχουσες τάσεις στον τομέα των μεταφορών και της διαχείρισης της εφοδιαστικής αλυσίδας και κατά πόσο συνδέονται με την πρωτοβουλία BRI;

Η πρωτοβουλία BRI αποτελεί ένα έργο μεγάλης κλίμακας το οποίο εκτείνεται σε πολλά διαφορετικά επίπεδα εφαρμογής, ενσωματώνοντας οικονομικές, πολιτικές, γεωγραφικές, πολιτιστικές και στρατηγικές πτυχές. Λόγω της κλίμακας και της πολυπλοκότητας του έργου, η μελέτη του θέματος σε πλήρη έκταση είναι πρακτικά μη εφικτή. Επιπλέον, η πρωτοβουλία BRI προτάθηκε μόλις πριν από πέντε χρόνια, με αποτέλεσμα τα περισσότερα από τα εμπλεκόμενα έργα να βρίσκονται σε πρώιμα στάδια ανάπτυξης ή λειτουργίας, θέτοντας σημαντικούς περιορισμούς στη διαθεσιμότητα και γενίκευση των σχετικών δεδομένων.

Για αυτόν τον λόγο, η μελέτη χρησιμοποιεί πολλαπλές μεθόδους έρευνας και πηγές δεδομένων, συμπεριλαμβανομένων τόσο ποσοτικών όσο και ποιοτικών δεδομένων, σε μια προσπάθεια να παράσχει μια διορατική και εις βάθος αξιολόγηση της επίδρασης της πρωτοβουλίας BRI στις διαδικασίες logistics στις ευρω-ασιατικές μεταφορικές συνδέσεις. Η εργασία αποτελείται από τα ακόλουθα έξι κεφάλαια στα οποία η έρευνα και τα αποτελέσματα παρουσιάζονται με μια γραμμική και λογική εξέλιξη:

- Κεφάλαιο 1 - Εισαγωγή: αυτό το εισαγωγικό κεφάλαιο περιγράφει και ορίζει το θέμα, παρουσιάζει μια επισκόπηση των ερευνητικών ερωτημάτων και αναλύει τον σκοπό, τους στόχους και το αντικείμενο της μελέτης.
- Κεφάλαιο 2 - Επισκόπηση βιβλιογραφίας: αυτό το κεφάλαιο παρουσιάζει την ανασκόπηση προηγούμενων σχετικών μελετών και σχετικής υπάρχουσας

βιβλιογραφίας. Παρέχει επίσης προκαταρκτικές πληροφορίες για μεγαλύτερη κατανόηση της έρευνας.

- Κεφάλαιο 3 - Μεθοδολογία: Το κεφάλαιο αυτό εξηγεί λεπτομερώς την επιλεγμένη μεθοδολογία που χρησιμοποιείται στην έρευνα και παρουσιάζει τις πηγές συλλογής δεδομένων και τις τακτικές ανάλυσης.
- Κεφάλαιο 4 - Αποτελέσματα: Αυτό το κεφάλαιο παρουσιάζει τα βασικά ευρήματα και αποτελεί το επίκεντρο της έρευνας.
- Κεφάλαιο 5 - Συζήτηση: Το παρόν κεφάλαιο παρουσιάζει τη σύνοψη των ευρημάτων, αναλύοντάς τα με περισσότερη λεπτομέρεια και παρέχοντας σχετικές ερμηνείες.
- Κεφάλαιο 6 - Συμπέρασμα: Στο κεφάλαιο αυτό περιλαμβάνονται τα συμπεράσματα που εξάγονται βάσει του κύριου σώματος της μελέτης, λαμβάνοντας υπ’ όψιν τους περιορισμούς της μελέτης, και παρέχει σχόλια για το μέλλον.

Καταλήγοντας, μέσα σε ένα περιορισμένο χρονικό διάστημα από τότε που ανακοινώθηκε για πρώτη φορά η πρωτοβουλία και παρά το γεγονός ότι η πλειονότητα των αναπτυξιακών έργων που εμπίπτουν στο πεδίο εφαρμογής της βρίσκονται ακόμη στο στάδιο της ανάπτυξής τους, γίνεται φανερό ότι το BRI έχει τη δυνατότητα να αναμορφώσει πλήρως το τοπίο των μεταφορών και των logistics στην ευρω-ασιατική ήπειρο.

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LIST OF ABBREVIATIONS

AIIB	Asian Infrastructure Investment Bank
ASEAN	Association of Southeast Asian Nations
BCIM	Bangladesh – China – India – Myanmar Economic Corridor
BRI	Belt and Road Initiative
CNY	Chinese Yuan Renminbi (currency)
CO_2	Carbon dioxide
COPHC	China Overseas Ports Holding Company
CPEC	China – Pakistan Economic Corridor
DWT	Deadweight tonnage
ERTG	Electrified rubber-tyred gantry crane
EU	European Union
EUR	Euro (currency)
FCL	Full Container Load
FDI	Foreign Direct Investment
FEU	Forty-foot Equivalent Unit
GDP	Gross Domestic Product
HS	Harmonized System (commodity description and coding system)

IT	Information Technology
ITV	Internal Transfer Vehicles
LCL	Less than Container Load
MSR	21st Century Maritime Silk Road
OBOR	One Belt, One Road
PCT	Piraeus Container Terminal S.A.
PPA	Piraeus Port Authority S.A.
RMG	Rail-mounted gantry crane
RTG	Rubber-tyred gantry crane
SEZ	Special Economic Zone
SREB	Silk Road Economic Belt
TAT	Turnaround Time
TEU	Twenty-foot Equivalent Unit
USD	Unites States Dollar (currency)

1. INTRODUCTION

1.1. Euro-Asian trade and the Belt and Road Initiative

Trading between Europe and Asia dates back to ancient times, when the Han Dynasty of China officially established commercial relationships between the two regions at around 130 BC, which flourished until 1453 AD, when the Ottoman Empire banned the trade with the west and blocked the routes. German geographer, cartographer and explorer, Ferdinand von Richthofen, was the first to use the term “Seidenstraße” (Silk Road) in 1877 to describe these trade routes in his publication following his travels in China, due to the fact that one of the major products traded was silk cloth from China. The term Silk Road has been since used to describe the ancient network of the trade routes that connected the East with the West, including the maritime section which connected China to Southeast Asia, Indonesian archipelago, the Indian subcontinent, the Arabian Peninsula, Egypt and Europe.

In September 2013, the Chinese government presented the Silk Road Economic Belt (SREB) proposal during President Xi Jinping’s visit in Kazakhstan and, in October of the same year, the 21st Century Maritime Silk Road (MSR) proposal during his visit in Indonesia. The SREB refers to an overland network (belt) of land corridors across Eurasia and the MSR designates a maritime route (road) connecting the South China Sea, the South Pacific Ocean and the Indian Ocean with Africa and Europe via the Suez Canal. These two major initiatives comprise the One Belt, One Road (OBOR) project, also known as the Belt and Road Initiative (BRI), a development strategy intending to revive the ancient Silk Road by promoting the connectivity and cooperation of the Eurasian countries.

The Silk Road Economic Belt is going to extend throughout Eurasia built on six international economic co-operation corridors (Figure 1.1.1):

- The New Eurasian Land Bridge, which runs from Western China to Western Russia through Kazakhstan.
- The China – Mongolia – Russia Corridor, which runs from Northern China to Russia through Mongolia.
- The China – Central Asia – West Asia Corridor, which runs from Western China to Turkey.
- The China – Indochina Peninsula Corridor, which runs from Southern China to Singapore.
- The Bangladesh – China – India – Myanmar (BCIM) Economic Corridor, which runs from Southern China to Myanmar.
- The China – Pakistan Economic Corridor (CPEC), which runs from Western China to Pakistan.

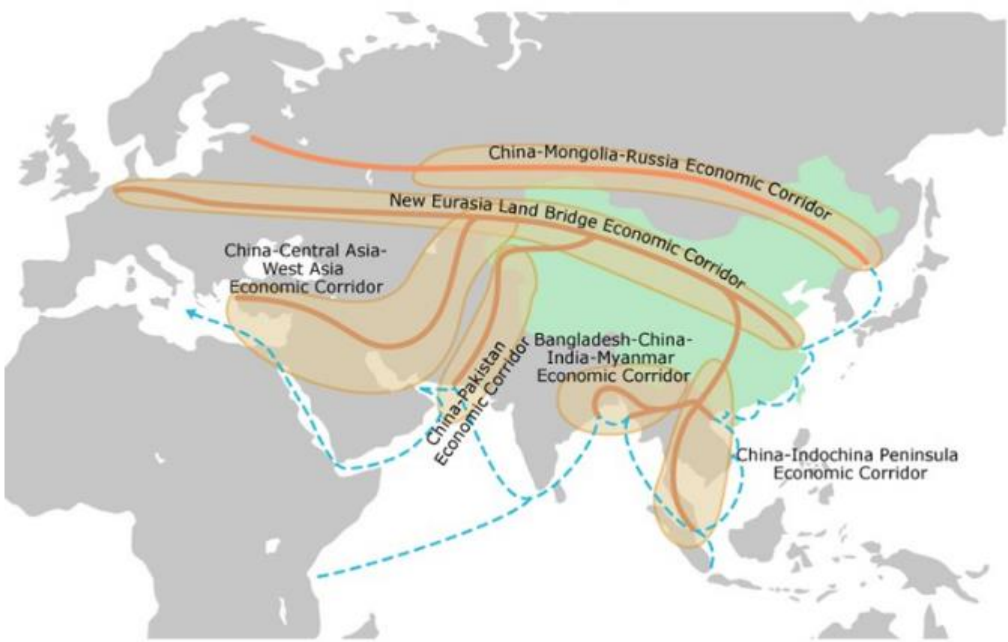

Figure 1.1.1: The Silk Road Economic Belt comprised of six land corridors.

Source: Hong Kong Trade Development Council

The BRI is analyzed in five key areas of focus, also referred to as the “Five Links”, which are the following:

- policy: planning, support and coordination on economic development and strategies
- roads: cross-border transportation infrastructure and facilities development
- trade: facilitating cross-border investments and supply chain cooperation
- currency: enhancing monetary policy coordination and bilateral financial cooperation
- people: promoting people-to-people bonds, cultural and social exchange

Following the proposition of the ambitious BRI, the Chinese government also proposed the development of the Asian Infrastructure Investment Bank (AIIB) in October 2013, for the support of the infrastructure needs in Asia. The AIIB was eventually established in 2015 as a multilateral development bank, aiming to finance the construction and improvement of infrastructure, particularly in the energy and transportation sectors, therefore acting as a facilitator for plenty of OBOR related projects. Apart from the AIIB, the Silk Road Fund was also founded in December 2014, with the Chinese government engaging USD 40 billion for the investment of OBOR projects through this state owned investment fund.

Presently, 65 countries, which account for half of the world’s population and one-third of the global Gross Domestic Product (GDP), are participating in the project. The capital needs for the implementation of the BRI are projected to exceed USD 1 trillion (Morgan Stanley Research, 2018). Understandably, the BRI has a significant potential to enhance the social and economic developments in Asia, Europe, and northeastern Africa, promoting political synergies, peace and stability.

1.2. Aim and objectives of the research

This research aims to investigate the development of logistics processes on Euro-Asian transport links. The Belt and Road Initiative, one of the largest infrastructure and investment projects in history, which aspires to improve and strengthen the connections between Asia and Europe with significant focus on logistics and transportation infrastructure development, has been the most remarkable advancement in recent years in the logistics sector. Thus, the purpose of the research is to provide a comprehensive understanding on the extent to which the BRI has affected the logistics processes between Europe and Asia.

One of the main objectives of this study refers to analyzing Euro-Asian trade over the past decade, identifying trends and interpreting shifts. The demand for transportation and logistics services is a derived demand arising from the demand for goods and, consequently, trade. Therefore, it is important to study and comprehend the bilateral trade development, in order to further understand the development of logistics demand between the two continents.

Furthermore, the study intents to raise knowledge of significant projects under the scope of the BRI, which are expected to change the existing logistics processes. The research will offer fundamental insight into the infrastructure and logistics system in the new Silk Road era, and will eventually help readers to gain general knowledge of the subject.

In light of the study's aim and objectives, the main research question develops as follows:

How has the Belt and Road Initiative affected the logistics processes between Europe and Asia?

Moreover, in order to answer the research question, four sub-questions have been defined:

- Has trade between Europe and Asia changed after the BRI has been announced?
- Has the cargo throughput of the transport corridors connecting Europe and Asia increased/decreased?
- Is there significant investment in logistics infrastructure and what are the main areas of focus?
- Which are the current supply chain and logistics trends and are they linked to the BRI?

Researching each of the sub-questions individually and in a gradual manner will allow the identification of enough pieces of information, which will contribute to the formulation of an answer to the main research question.

1.3. Scope and delimitations

The BRI is a large-scale project which extents on many different levels of application, incorporating economic, political, geographical, cultural, and strategic aspects. Due to the scale and complexity of the project, the study of the topic at its full extent is moderately infeasible. Furthermore, the OBOR initiative was proposed just five years ago, thus most of the involved projects are in their early stages of development, or operation, posing important restrictions in the availability and generalization of relevant data.

For this reason, the study will use multiple methods of research and data sources, including both quantitative and qualitative data, in an effort to provide an insightful and in-depth evaluation of the BRI effect on logistics processes on Euro-Asian transport links. The paper consists of the following six chapters where the research and results are presented in a linear and logical progression:

- Chapter One – Introduction: this introductory chapter describes and defines the subject, gives an overview of the research questions and discusses the aim, the objectives and the scope of the study.

- Chapter Two – Literature Review: this chapter presents the review of previous related work and relevant existing literature. It also provides preliminary information for greater understanding of the research.
- Chapter Three – Methodology: this chapter explains in detail the selected methodology used in the research, as well as presents the data collection sources and analysis tactics.
- Chapter Four – Results: this chapter presents the key findings and represents the focal point of the research.
- Chapter Five – Discussion: this chapter presents the summary of the findings, discusses them in further detail and provides interpretations.
- Chapter Six – Conclusion: this chapter includes the deduction made based on the main body of the study, considering the study's limitations, and provides comments about the future.

2. LITERATURE REVIEW

This chapter will cover an extended review on the most significant existing literature. The overall goals are to demonstrate the importance of the field of study and identify the areas in which new contributions could be made.

The major themes that the literature review will focus on are the Belt and Road initiative and the ongoing logistics processes and trends related to transportation between Europe and Asia. A synthesis of appropriate information from relevant publications, including scientific journals, research papers, academic texts, articles, will be presented to provide an overview of the existing knowledge.

2.1. The Belt and Road Initiative

2.1.1. Motivation and rationale

Almost 35 years since the beginning of the Chinese economic reform and after having witnessed its annual trade growth rates shape in double digits during the 2000s, China emerged as the second largest economy in the world in 2009. Nevertheless, it remained an upper-middle income country in hopes of developing into a high income one (Lin, 2015). Therefore, the Belt and Road Initiative may be seen as an effort for China to move away from its low-profile foreign policy and adopt a proactive strategy in order to contend for more achievements.

Besides the government’s desire to take on a leading role in the world stage, there are more motives behind the OBOR strategy proposal. Overproduction in the construction materials sector and overcapacity in the infrastructure construction industry creates the need for Chinese companies to expand their businesses into international markets. Furthermore, with salaries in China continuously rising due to the country's economic development, the labor-intensive industries have started to lose their competitive advantage and need to relocate their manufacturing facilities to low-wage destinations. The majority of the countries along the OBOR have a GDP per capita less than half of that of China, making them ideal candidates. Likewise, the largely neglected and underprivileged central and western provinces of China could also accommodate these labor-intensive manufacturing industries, benefiting from the trade facilitation and economic growth stimulation (Li, 2015; Lin, 2015).

Minghao (2016) and Yu (2016) further identify China's need to secure access to raw materials and energy from countries and regions along the Silk Road, while developing new markets and reliable trade and transportation routes. Action towards this direction is imperative since China has developed to the world's largest energy consumer and the largest net importer of oil, mainly due to its thriving manufacturing industry. Moreover, the Chinese government is determined to tackle the pollution problem, by switching to cleaner energy sources, which are mainly imported (Djankov & Miner, 2016). As Clarke (2016) points out, an essential common point of the land and maritime Silk Road is their ability to widen access to the energy resources of Central Asia and the Middle East.

2.1.2. Opportunities and challenges

The advantages of the Chinese initiative are directly linked to the realization of its goals, but the benefits are not only for China itself, but also for countries along the routes. Developing countries, which struggle financially to develop infrastructure, will have the opportunity to industrialize through foreign investment and boost their economies (Lin, 2015). Yu (2016) emphasizes the lack of financial resources that South Asian countries, such as Thailand, Malaysia, Philippines and Indonesia, face and how they are unable to meet the increasing demand for infrastructure upgrade deriving from their accelerated urbanization. Foreign Direct Investment (FDI) could help address this issue in a “win-win” manner.

The enhancement of infrastructure across Eurasia will lead to the creation of a network of efficient and safe transportation routes, thus reinforcing the connectivity among countries and, as a result, increase trade and investment. Consequently, the tight economic ties will encourage political trust, openness and inclusiveness, cultural exchange, mutual learning and understanding, reviving the spirit of peace and friendship of the ancient Silk Road (National Development and Reform Commission, 2015).

Chinese officials strongly believe that the countries’ cooperation under the BRI will help address the instability and violence in Central Asia (Minghao, 2016). Clarke (2016) also discusses that the economic development, which the BRI will bring to the Chinese autonomous territory of Xinjiang, Tibet and the neighboring countries of Afghanistan and Pakistan will promote stability and security in the region and will eliminate extremism and terrorism.

Despite the potential benefits of the initiative, there are still risks and challenges connected to the project. International observers and neighboring countries are skeptical of China’s real intentions behind the BRI, believing that the strategy is a way for China to dominate economically and militarily in Asia (Du, 2016). Member states of the Association of Southeast Asian Nations (ASEAN) fear that China intends to take control over areas and maritime routes in the region, which makes these countries reluctant to join the initiative. India, Japan, and the US have also reacted in disbelief to the BRI (Haggai, 2016; Yu, 2016). Furthermore, Li & Schmerer (2017) discuss that European countries are also worried about losing control, mainly due to the fact that the way that China endorses partnerships is not based on any codified law and therefore lacks transparency.

It becomes apparent that China will need to debate and negotiate to promote trust and political interest in the project (Du, 2016). However, an internal and central coordination mechanism for the OBOR project should be implemented first in order to eliminate confusion as to who is in charge and carefully plan the way forward (Huang, 2016; Yu, 2016). One of the most significant challenges to overcome will be streamlining the transport processes along the routes. Harmonization of infrastructure (e.g. different rail gauges amongst the participating countries), customs formalities and border procedures are essential for the project's success (Nazarko, Kuźmicz, & Czerewacz-Filipowicz, 2016)

2.1.3. Significant OBOR projects

The China – Pakistan Economic Corridor (CPEC) is the biggest project under the scope of the OBOR initiative. Consisting of a collection of infrastructure projects valued at USD 62 billion, it is considered as a "flagship project" of the BRI. The investment, which is the largest Chinese investment in a foreign county to date and stands for roughly 21% of Pakistan's annual GDP, includes a series of transportation infrastructure and energy projects.

The CPEC will run from the city of Kashgar in Xinjiang, China, to the port of Gwadar on the southwestern coast of Balochistan, Pakistan, expanding on a vast network of highways, railways and pipelines. Irshad (2015) refers to the development of Gwadar port as the "precious stone in the crown" for China as it will ensure stable and secure access to the Indian Ocean and to the Persian Gulf.

The port of Gwadar is a location of great geopolitical value due to its strategic position between South Asia, Central Asia and the Middle East and its proximity to the Strait of Hormuz, the passageway for 20% of the world's petroleum. Apart from securing access to the Persian Gulf, Gwadar Port will provide China with an alternative to the traditional route through the Strait of Malacca; a crowded, narrow and swallow stretch of water between Malaysia and Singapore, which is one of the world's most piracy affected areas.

Due to the significant presence of the U.S. Navy which patrols the strait, China is concerned about a potential blockade by the United States and its allies. Currently, 60% of China's oil imports originate from the Middle East and 80% of that is shipped to China via this strait, along a 12,000-kilometer-long sea route from the Middle East to the eastern ports of China. Shifting the transportation of oil via Gwadar Port and the CPEC to Kashgar, will not only be a safer route but also more cost and time efficient (Butt & Butt, 2015).

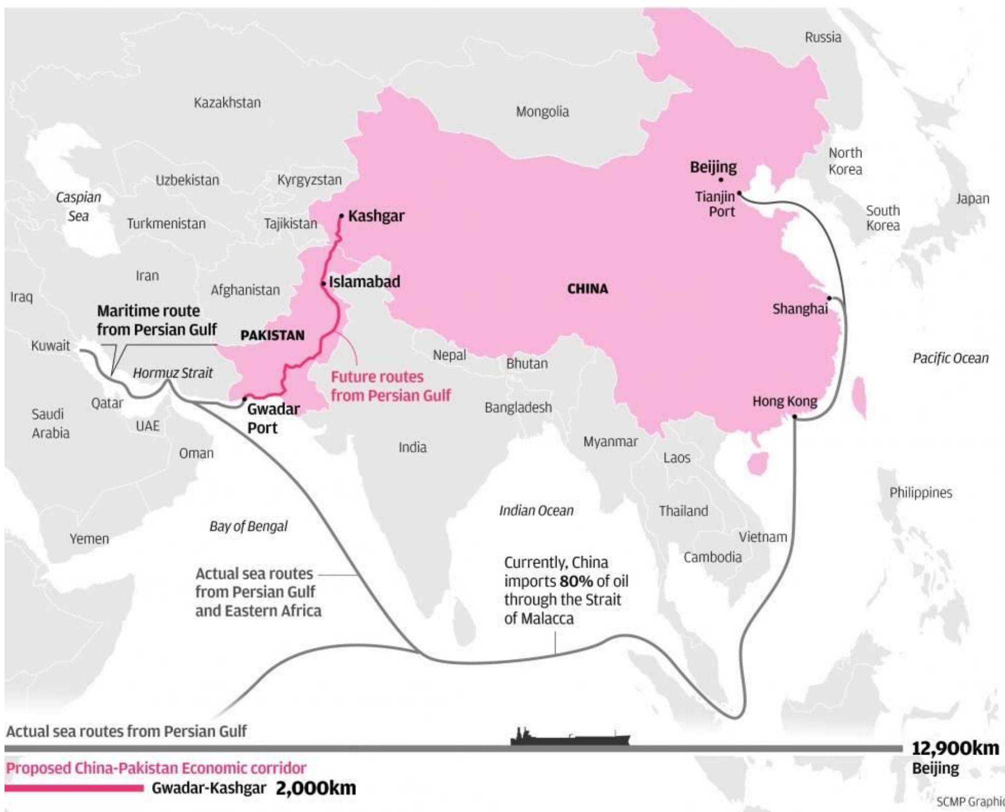

Figure 2.1.1: Future CPEC route compared with existing sea route.

Source: South China Morning Post

Dave & Kobayashi (2018) identify the CPEC along with the special economic zone (SEZ) “Khorgos – Eastern Gate” and the “Khorgos Gateway” dry port as the two key projects under the BRI. The Khorgos Gateway is located at the Kazakh border with China, opposite to the Chinese city of Khorgas, and connects China with Kazakhstan by rail.

Built adjacent to the pre-existing train station of Altynkol, more than 2,500 kilometers away from the nearest ocean, the dry port began its operations in July 2015 and is expected to become the world's biggest dry port.

Kazakhstan is of primary importance to China and to the implementation of the OBOR initiative due to its position at the junction between the East and the West, serving as a bridge connecting Asia and Europe. It is not a coincidence, but rather a symbolism, that the Chinese President Xi Jinping chose to announce the proposal of the SREB in Astana in September 2013. Apart from its key geographic location, Kazakhstan is also a significant energy partner of China, delivering oil and gas through the Kazakhstan-China oil pipeline, with a capacity of 22 billion liters of crude oil per year, and the Central Asia-China gas pipeline, with a capacity of 55 billion cubic meters of natural gas per year (Fazilov & Chen, 2013).

The rail and logistics infrastructure of the Khorgos development aims to increase the capacity and effectiveness of the land corridors between Kazakhstan and China, allowing the potential transportation of some additional 40 million tons. Hewlett Packard, Toyota, DB Schenker, FESCO and BRAVIS were the first companies to sign agreements with the new dry port to compose container trains which will pass through Altynkol station and be handled in Khorgos Gateway (Zhartay & Semak, 2016).

2.2. Logistics processes

2.2.1. Trends in maritime transport

During the last decade, cargo lines and especially container lines have adopted the practice of slow steaming. Slow steaming refers to the process of deliberately decreasing the speed of a vessel in order to reduce fuel consumption and save on fuel costs. It was first adopted by Maersk Line in 2009 and later on by the majority of container lines, as a response to the declining freight rates, the rising fuel prices and the global financial crisis (Lee, 2014).

A container ship practicing slow steaming usually sails at a speed of 12-19 knots instead of the normal 20-24 knots (Sanguri, 2012). Wackett & Hailey (2013) discuss that reducing the speed of a 10,000 TEU containership from the optimal speed of 20-25 knots to 18-20 knots could lead to bunker fuel savings of 175 tons per day and super-slow steaming at 15-18 knots could result to additional savings of 100 tons per day. Moreover, for every ton of fuel that the industry saves, the CO_2 emissions are reduced by three tons (Wiesmann, 2010).

A recent study evaluates the impact of the MSR on the Eastern China – Northern Europe route (Schinas & von Westarp, 2017). The study takes into consideration the bunker costs, port costs, time charter costs and fixed costs in connection with the number of vessels employed and their average speed, in order to determine the optimal solution for the service line. The results show that employing 13 vessels on an average speed of 15 knots minimizes the total costs for the current service. In a future OBOR scenario in which Mediterranean ports (Piraeus and Trieste) will serve as the European terminals of the route, instead of the Northern European ports, the optimum solution turns out to be operating 11 vessels on an average speed of 15.9 knots.

2.2.2. Trends in land transport

The rise of rail transportation between China and Europe is considered the greatest development in Eurasian land transport in recent years. Regular direct cargo rail services currently connect 38 Chinese cities with 36 cities in 13 European countries, when just a decade ago there were no such direct connections. Rail transport is a much cheaper option than air and faster than sea, making it an appealing middle option (Hillman, 2018).

DB Schenker became the first freight forwarder to operate a regular service between China and Europe in 2011. Company data from 2015 reveal that transporting a notebook door-to-door from Central China to the Netherlands by rail is 79% cheaper and 18 days slower than air freight, while in comparison to sea freight the transport cost is double and the lead time 16 days faster. Rail transport further offers a much more environmentally friendly alternative. The CO_2 emissions of rail per freight ton are 30% less than those of sea freight and 99.95% less than those of air freight (DB Schenker, 2015).

A recent study shows that rail freight between Europe and Asia is about 80% cheaper than air freight and two times faster than sea freight (Schramm & Zhang, 2018). The study further identifies the type of goods for which rail transport is the optimal option compared to all other modes of transports, suggesting that total logistics costs are minimized by using rail services for time sensitive goods with value between USD 1.23 and USD 10.89 per kilo, and less time sensitive goods with higher value ranging from USD 2.46 to USD 21.78 per kilo.

Furthermore, an economic analysis by ING (2018) estimates that more than 75% of the value of China's exports to the EU and more than 60% of the EU's exports to China are comprised of time sensitive goods. This indicates that a large proportion of EU-China trade could potentially shift from air and sea to rail transport.

The shift of the manufacturing industry to the west of China due to the increasing labor costs in Eastern China promotes the potential of rail services to Europe as well. Major companies such as Hewlett-Packard, Foxconn, Ford motors, and BASF have moved their factories in Chongqing in Central China, taking advantage of the Yuxinou direct rail service from Chongqing to Duisburg, Germany, covering the 11,179 kilometer distance in 13 days (Li, Bolton, & Westphal, 2018). The freight rate on this service line has significantly decreased from USD 1 per TEU per kilometer in 2011 to USD 0.55 per TEU per km by 2015 (Tsang, 2015), or USD 6,150 per TEU per trip.

In 2018, the freight rate on the Yuxinou line is estimated between USD 4,000 and USD 4,500 per TEU, of which USD 1,750 to USD 2,000 is subsidized by the Chinese government. The subsidized freight rates from China to Europe range between USD 2,250 and USD 3,750 per TEU, depending on the rail route. The container freight rates are expected to decline by 30% by 2030 (Vinokurov, Lobyrev, Tikhomirov, & Tsukarev, 2018).

2.2.3. The role of logistics infrastructure

In their recent study, Li, Jin, Qi, Shi, & Ng (2018) discuss the beneficial effects of logistics infrastructure on economic growth. Investments in the maintenance or construction of transportation infrastructure (roads, railways, ports, airports) are a significant element of a country's GDP, as they create new jobs and generate demand. Improved logistics infrastructure further promotes accessibility, reduces travel times and generally benefits labor mobility and local trade.

In addition, the reduced transportation costs resulting from the logistics infrastructure improvement stimulate the concentration of industrial and economic activities and attract foreign direct investment, which also facilitates further economic support through capital inflows and employment opportunities (Hong, Chu, & Wang, 2011). Finally, research on the logistics performance impact on global economic growth has shown that a 1% increase in logistics activity results to increase in economic growth from 0.011% to 0.034% (Coto-Millán, Agüeros, Casares-Hontañón, & Pesquera, 2013).

3. METHODOLOGY

The overall purpose of this chapter is to outline how the research objective is going to be achieved and how the research questions are going to be answered. It discusses in detail the methodology that has been adopted in the study, providing information and reasoning regarding the research approach and the development process. The chapter presents the various stages followed, including the selection of research area, the sources of data collection and the data analysis techniques.

3.1. Research design

The objective of the study is to analyze the extent to which the Belt and Road Initiative has affected the logistics processes between Europe and Asia. However, as described in the delimitations section of the introductory chapter, the topic is profoundly broad, with applications on many different areas and levels and with indefinite factors, making it hardly possible to provide final and conclusive findings. Consequently the undertaken study may be defined as an exploratory research.

Exploratory research is an investigation of a subject in an attempt to gain further insight by exploring the research questions and providing an in-depth analysis on the topic. It is used when a new phenomenon is being studied, on which little or no previous research exists, or in cases when a problem is extensive and not clearly defined. An exploratory study is a valuable method to understand what is happening, to give new insights, to ask questions, to reevaluate phenomena and to develop ideas and hypotheses for future research (Robson, 2002).

A research approach may be deductive, when a theoretical or conceptual framework is initially developed through the literature and then tested using data, or it can be inductive when the theory is developed as a result of the data analysis and subsequently linked to the literature (Saunders, Lewis, & Thornhill, 2009). For this research project an inductive research approach will be adopted, as it will first explore the collected data in an attempt to develop theories from them. Although the study has a clearly defined purpose, objectives and research questions, it will not follow any predetermined theory or conceptual framework.

Further, the study is going to use the research strategy of grounded theory, which refers to the systematic methodology of data collection in order to reach conclusions containing theoretical insights (Saunders et al., 2009). Grounded theory is a method that accepts qualitative and quantitative data collection from surveys, experiments, and case studies (Glaser, 1978) and data generated by a series of observations (Saunders et al., 2009). Glaser and Strauss (1967) stress the importance of combining theoretical and empirical methods in ground theory research in order to complement the gained insight.

The first two sub-questions will be addressed by the conduction of quantitative data analysis of time series data. Trade data and throughput data will be presented in time series plots and the interpretation of the key results will be presented. For the latter two sub-questions a collective case study approach will be adopted. In other words, a number of cases will be studied together in an attempt to provide broader insight into the system as a whole. The literature survey provided an important input in determining which cases should be selected.

A case study research often involves the use of multiple methods of data collection, as it aims to offer comprehensive understanding of the complexity of a case. The mixed data collection methods refer to both qualitative and quantitative data, and thus enable the researchers to obtain the richest possible understanding of a topic as a result of this multi-level approach (Stake, 1994).

3.2. Data collection

Data regarding the trade figures of the past decade for Europe, Asia, China and the commodities traded have been obtained from the International Trade Centre, a joint agency of the World Trade Organization and the United Nations, through the United Nations Conference on Trade and Development.

With reference to the case studies, data from multiple sources have been gathered. As far as the Port of Gwadar is concerned, data have been mainly obtained from Gwadar Port Authority and China Overseas Ports Holding Company, which is the operator of the port. Furthermore, information from published work and from the Pakistan Bureau of Statistics has been used. As for the Port of Piraeus, the data have been collected from Piraeus Port Authority, Piraeus Container Terminal, and Eurostat.

Data from Pakistan Railways, the national, state-owned railway company of Pakistan, have been gathered for studying the hinterland connections of the Port of Gwadar, while for the case of Piraeus Port, data from COSCO SHIPPING Lines (Greece) S.A. have been used. Information regarding distances has been obtained either from the website Ports.com for nautical distances, or from Google Maps for land distances.

For the case of the Eurasian Land Bridge, data from many different sources have been gathered, including the China Railway Express, which is a cargo railway line and subsidiary of China Railway, the South China Morning Post, which is a Hong Kong English-language newspaper and Hong Kong's newspaper of record, the KTZE – Khorgos Gateway LLP, which is the owning and operating company of the Khorgos Gateway dry port, the statistics portal Statista, the National Bureau of Statistics of China, and the Ministry of national economy of the Republic of Kazakhstan – Committee on statistics.

All sources of data are properly cited in-text when introduced in the next chapter, where the key findings of the research are presented.

3.3. Data analysis

The main tool used for the analysis of the data was Microsoft's spreadsheet application, Microsoft Excel. The data have been inserted into tables in a clear and logical manner, so that the findings are presented in a fully comprehensible way. In addition, when necessary, charts and figures have been used in order to improve the perception and illustrate the line of reasoning.

For the analysis of geographic data and the demonstration of transport routes, a cartographic map has been produced and is presented in the summary chapter, intending to guide the reader to understanding the complete geographic extent and potential of the BRI through the visualization of the study's content. The tool used for the creation of the map was Esri ArcGIS, a geographic information system for working with maps and geographic information.

4. RESULTS

4.1. Trade development in Europe and Asia

4.1.1. Euro-Asian trade

The global financial crisis of 2008-2009 forced the collapse of international trade in 2009. Europe's trade shrank by one-quarter, with exports decreasing by USD 1.6 trillion and imports by USD 1.8 trillion. However, the recovery was rather speedy and trade figures reached pre-crisis levels by 2011.

Importantly, the economic crisis marked a turning point for Europe's balance of trade, as the years leading to the economic downturn it had suffered a trade deficit. Europe has managed to maintain its trade surplus, strengthening its economy, and also having registered a historic high value of exports of USD 7.3 trillion in 2013.

A substantial part of the recorded decline in trade in 2015 is attributed to the appreciation of the US dollar. Indicatively, the exchange rate from Euro to US Dollar dropped from 1.36 in June 2014 to 1.10 in June 2015, and remained between 1.11 and 1.12 in 2016 and 2017.

Table 4.1.1 and Figure 4.1.1 present Europe's trade figures over the past decade.

Table 4.1.1: Europe's exports to world, imports from world and balance of trade

Unit: USD billion

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Europe's exports	6,814	5,187	5,909	6,995	6,829	7,292	7,227	6,218	6,098	6,745
Europe's imports	6,922	5,175	5,891	6,952	6,645	6,866	6,851	5,865	5,848	6,510
Balance of trade	-108	12	17	43	184	426	376	353	250	235

Note. Data from International Trade Centre.

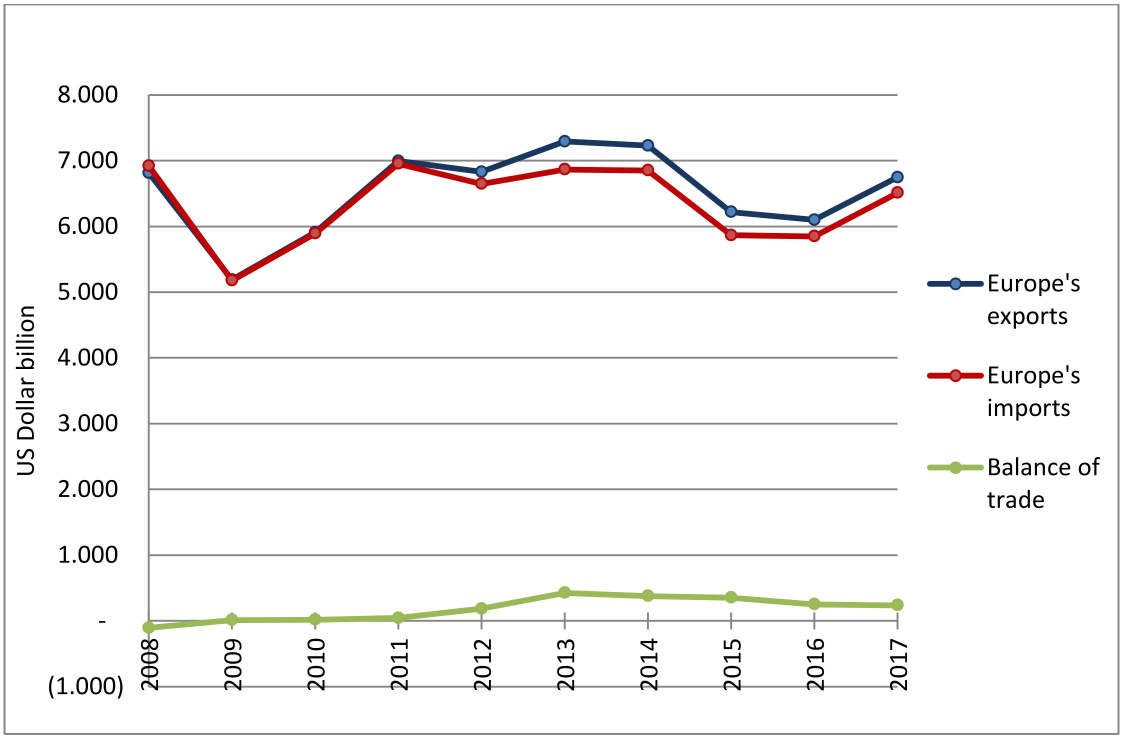

Figure 4.1.1: Europe's exports to world, imports from world and balance of trade

Asia's economy was able to recover from the decline of 23% in trade, caused by the global recession, much faster and stronger. In just one year trade returned to pre-crisis levels and in the second year after the recession it recorded a 22% increase in comparison to pre-crisis levels, growing by USD 2.38 trillion. In the years following the announcement of the BRI, Asia has also increased its trade surplus, establishing an average positive balance of USD 579 million (Table 4.1.2; Figure 4.1.2).

Table 4.1.2: Asia's exports to world, imports from world and balance of trade

Unit: USD billion

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Asia's exports	5,676	4,356	5,661	6,808	7,363	7,549	7,675	6,786	6,551	7,040
Asia's imports	5,154	4,006	5,220	6,406	6,916	7,129	7,114	6,155	5,928	6,540
Balance of trade	522	350	442	403	447	420	561	632	623	501

Note. Data from International Trade Centre.

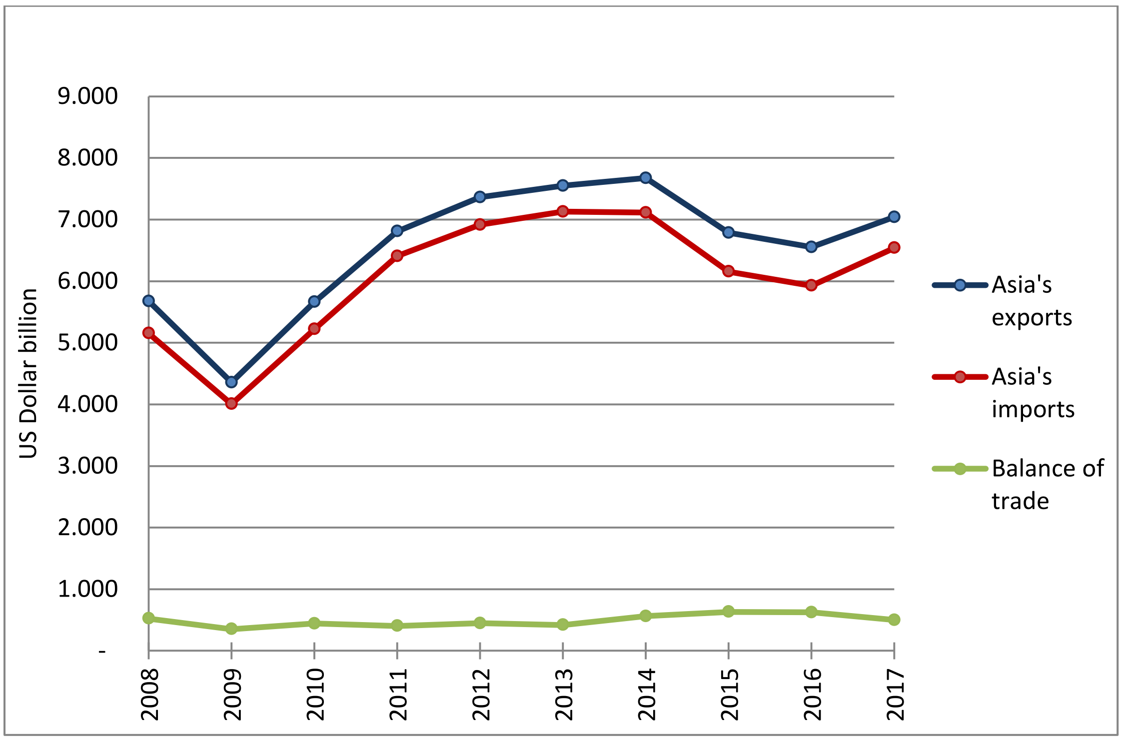

Figure 4.1.2: Asia's exports to world, imports from world and balance of trade

As far as bilateral trade is concerned, Asia's exports value to Europe has always exceeded the value of imports from Europe. The bilateral trade deficit for Europe was as high as USD 453 billion in 2008. After having rebounded from the economic downturn, Europe's exports to Asia steadily increased, while its imports from Asia started to decline, leading to the bilateral deficit reaching its lowest point of USD 115 billion in

2013. After that point the deficit between Europe's exports to Asia and Asia's exports to Europe started to increase again (Table 4.1.3; Figure 4.1.3).

Table 4.1.3: Bilateral trade between Europe and Asia

Unit: USD billion

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Europe's exports to Asia	849	707	849	1,036	1,095	1,222	1,179	1,034	998	1,113
Asia's exports to Europe	1,302	982	1,218	1,443	1,345	1,337	1,364	1,219	1,256	1,378
Balance of Trade	453	275	369	407	249	115	186	185	257	265

Note. Data from International Trade Centre.

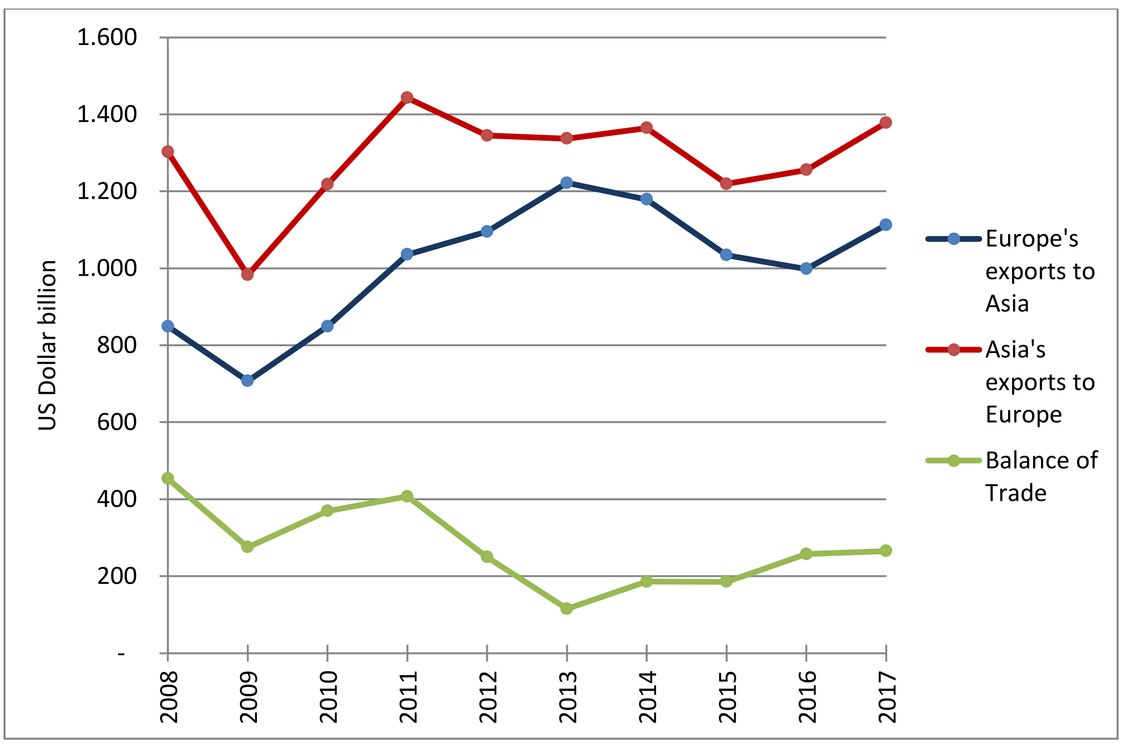

Figure 4.1.3: Bilateral trade between Europe and Asia

4.1.2. The impact of China

China was affected significantly less by the global economic crisis, since its trade shrank by just 14%, making the downturn less steep and easier to overcome. Trade figures have steadily increased and from the starting point of the BRI onwards, China has managed to widen the gap between its exports and imports, solidifying a balance of trade of half trillion US dollars, up from an average of USD 215 billion during the years before the BRI announcement. This trade surplus is an important indicator of China's economy emerging more powerful during the implementation of the BRI (Table 4.1.4; Figure 4.1.4).

Table 4.1.4: China's exports to world, imports from world and balance of trade

Unit: USD billion

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
China's exports	1,431	1,202	1,578	1,898	2,049	2,209	2,342	2,273	2,098	2,272
China's imports	1,133	1,006	1,396	1,743	1,818	1,950	1,959	1,680	1,588	1,841
Balance of trade	298	196	182	155	231	259	383	594	510	431

Note. Data from International Trade Centre.

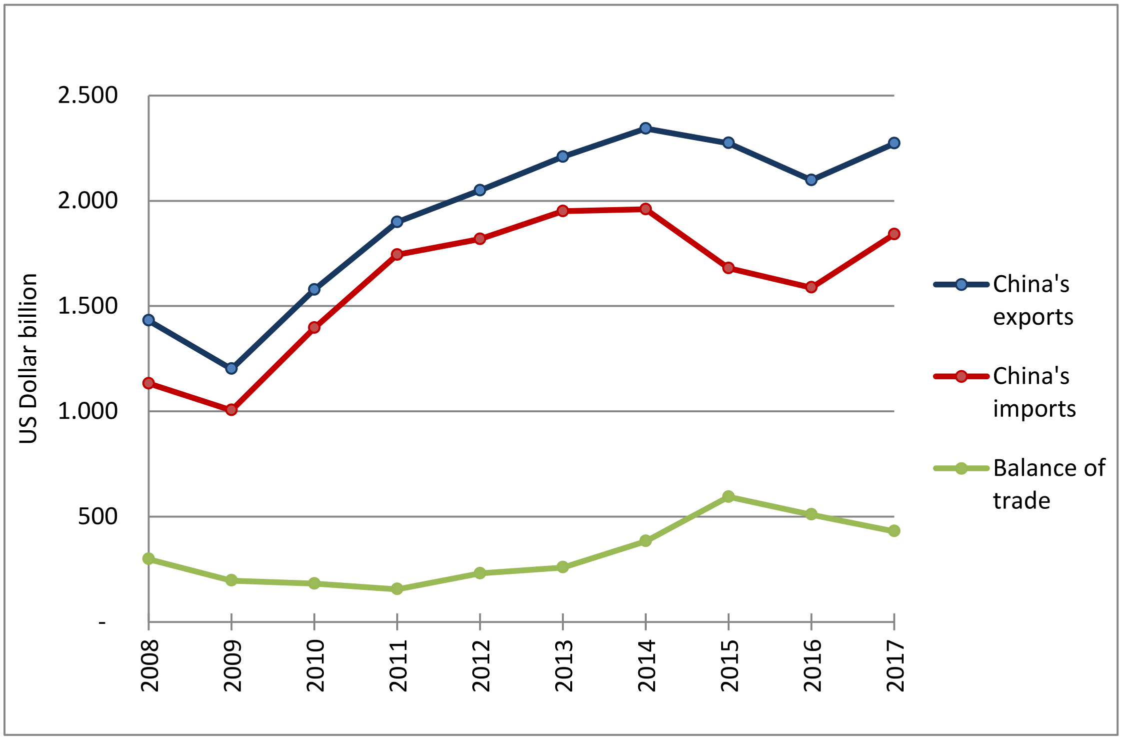

Figure 4.1.4: China's exports to world, imports from world and balance of trade

Regarding trade between China and Europe, China's exports to Europe have always exceeded Europe's exports to China. Not only China's exports to Europe exceed the imports from Europe, but they are actually more than twice as much, leading to great trade imbalances. During the last decade, the average value of Europe's exports to China was USD 226 billion, while the value of imports from China USD 504 billion. Notably, up until 2013 the trade surplus value for China was more than the value of imports from Europe. Although the European exports to China have increased in the past years, China's exports to Europe have increased accordingly, keeping the trade imbalance at the same levels (Table 4.1.5; Figure 4.1.5).

Table 4.1.5: Bilateral trade between Europe and China

Unit: USD billion

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Europe's exports to China	145	140	181	240	236	260	280	243	248	290
China's exports to Europe	458	375	481	535	499	525	553	520	515	577
Balance of Trade	313	235	299	294	264	265	273	277	267	288

Note. Data from International Trade Centre.

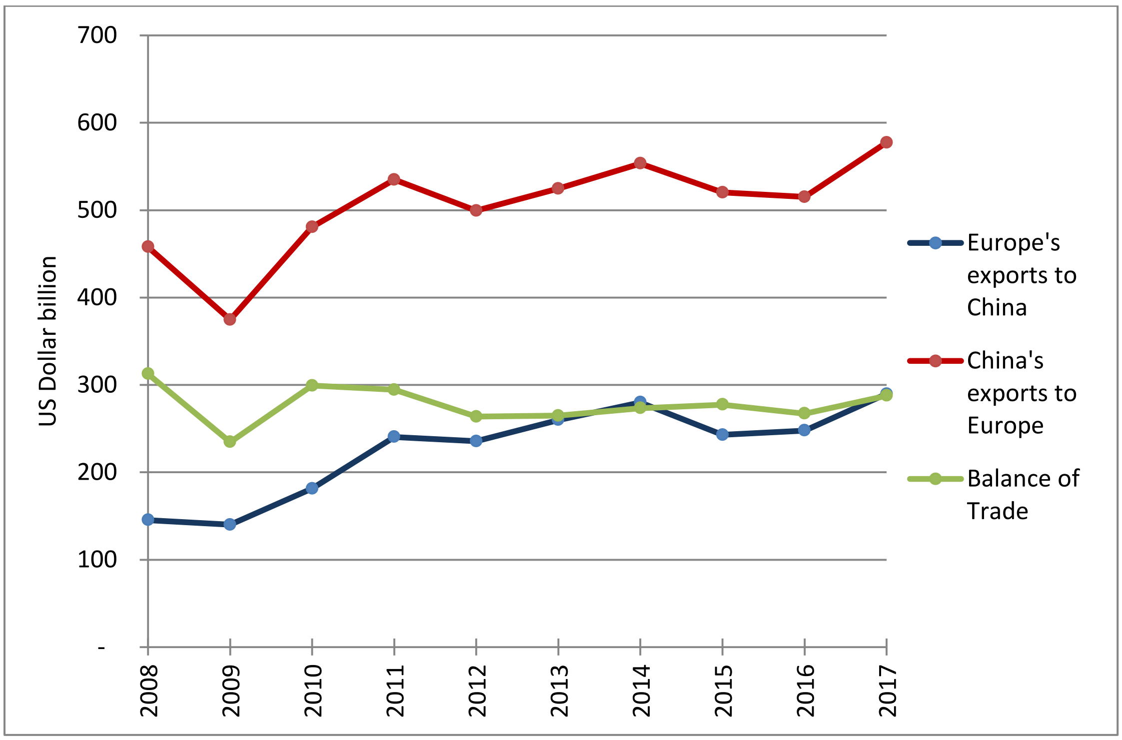

Figure 4.1.5: Bilateral trade between Europe and China

In the years following the BRI announcement, China has managed to increase its share in Asian trade. China's total exports now account for 32% of total exports from Asia, up from an average of 27% before the BRI, while its imports' share increased from comprising an average of 25% to an average of 27% of the total imports of Asia after the BRI (Table 4.1.6).

Table 4.1.6: China's share on Asian trade

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
China / Asia exports	25%	28%	28%	28%	28%	29%	31%	34%	32%	32%
China / Asia imports	22%	25%	27%	27%	26%	27%	28%	27%	27%	28%

With regard to bilateral trade between Asia and Europe, China improved its share after the OBOR project announcement. Prior to the BRI, China held an average of 37% of total exports to Europe, while its share is currently 41% of the total Asian exports to Europe. Furthermore, China now accounts for 24% of Asian imports from Europe, increased from 21%, which was the average proportion of China to the total imports of Asia from Europe (Table 4.1.7).

Table 4.1.7: China's share on bilateral trade between Europe and Asia

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
China / Asia exports to Europe	35%	38%	39%	37%	37%	39%	41%	43%	41%	42%
China / Asia imports from Europe	17%	20%	21%	23%	22%	21%	24%	23%	25%	26%

4.1.3. Commodities

Europe's exports to Asia

Europe's primary export commodities to Asia include machinery and mechanical appliances (e.g. turbines, pumps), cars and car spare parts, precious metals/stones (gold, diamonds) and jewellery. These three commodities constitute one-third of Europe's exports to Asia, an overall value of USD 362 billion in 2017.

Other important commodities include electronic machinery and equipment (electronic integrated circuits, telephone sets, and more), petroleum and its by-products, pharmaceutical products and medical/surgical equipment. Table 4.1.8 presents the top ten commodities of Europe's exports to Asia, including their traded value in 2017 and their proportion to the total exports.

Table 4.1.8: Primary commodities of Europe's exports to Asia

HS Code	Harmonized Commodity Description	2017 Value (USD billion)	Share of exports
84	Machinery; mechanical appliances; nuclear reactors; boilers; parts thereof	170	15.2%
87	Vehicles other than railway or tramway rolling stock; parts and accessories thereof	98	8.8%
71	Natural, cultured pearls; precious, semi-precious stones; precious metals, metals clad with precious metal; imitation jewellery; coin	95	8.5%
85	Electrical machinery and equipment; sound and image recorders and reproducers; parts and accessories thereof	94	8.4%
27	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes	91	8.2%
30	Pharmaceutical products	59	5.3%
90	Optical, photographic, cinematographic, measuring, checking, medical or surgical instruments and apparatus; parts thereof	53	4.7%
88	Aircraft, spacecraft, and parts thereof	49	4.4%
39	Plastics and articles thereof	27	2.4%
72	Iron and steel	26	2.4%

Note. Data from International Trade Centre.

Europe's imports from Asia

More than one-fifth of Europe's imports from Asia consist of electrical machinery and equipment. Mobile phones and telephone sets, electronic integrated circuits, monitors and projectors, are some of the main electrical parts that Europe imports from Asia. Their total value amounted to USD 283 billion in 2017.

The second most important commodity imported regards machinery and mechanical appliances with a 15.2% share of total imports and a value of USD 209 billion in 2017. Of this total, automatic data-processing machines and units (computers, laptops, tablets, etc.) account for USD 71 billion, printing machinery for USD 21 billion and other computer accessories and parts for USD 15 billion.

Articles of apparel and clothing accessories hold 8.4% of the total imports from Asia, while adding the share of footwear to that, the percentage stands at 10.6% of the total imports. Other significant commodities include petroleum, cars and car parts. Table 4.1.9 demonstrates the top ten commodities of Europe's imports from Asia, including their traded value in 2017 and their proportion to the total imports.

Table 4.1.9: Primary commodities of Europe's imports from Asia

HS Code	Harmonized Commodity Description	2017 Value (USD billion)	Share of imports
85	Electrical machinery and equipment; sound and image recorders and reproducers; parts and accessories thereof	283	20.5%
84	Machinery; mechanical appliances; nuclear reactors; boilers; parts thereof	209	15.2%
61/62	Articles of apparel and clothing accessories	116	8.4%
27	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes	98	7.1%
87	Vehicles other than railway or tramway rolling stock; parts and accessories thereof	90	6.5%
71	Natural, cultured pearls; precious, semi-precious stones; precious metals, metals clad with precious metal; imitation jewellery; coin	56	4.1%
90	Optical, photographic, cinematographic, measuring, checking, medical or surgical instruments and apparatus; parts thereof	38	2.8%
39	Plastics and articles thereof	37	2.7%
29	Organic chemicals	36	2.6%
64	Footwear, gaiters and the like; parts thereof	30	2.2%

Note. Data from International Trade Centre.

Europe's exports to China

Similarly to the exports to Asia, the top two export commodities from Europe to China consist of machinery and mechanical appliances, and vehicles/cars and car parts. These two commodities account for 28.5% of Europe's exports to China, and complemented by mineral fuels (petroleum) and electrical equipment, they make up half of the total exports. Electrical machinery and equipment mainly includes electronic integrated circuits, electric control and electricity distribution panels, boards and consoles, and electrical apparatus for used in electrical circuits, such as switches, relays, fuses, plugs, and so on.

The other half of Europe’s exports to China mainly includes commodities like medical/surgical instruments and apparatus, jewellery, pharmaceutical products, and aircrafts (airplanes and helicopters). Table 4.1.10 provides in further detail the top ten commodities of Europe’s exports from China, including their traded value in 2017 and their proportion to the total exports.

Table 4.1.10: Primary commodities of Europe’s exports to China

HS Code	Harmonized Commodity Description	2017 Value (USD billion)	Share of exports
84	Machinery; mechanical appliances; nuclear reactors; boilers; parts thereof	45	15.4%
87	Vehicles other than railway or tramway rolling stock; parts and accessories thereof	38	13.1%
27	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes	32	10.9%
85	Electrical machinery and equipment; sound and image recorders and reproducers; parts and accessories thereof	29	10.0%
90	Optical, photographic, cinematographic, measuring, checking, medical or surgical instruments and apparatus; parts thereof	16	5.4%
71	Natural, cultured pearls; precious, semi-precious stones; precious metals, metals clad with precious metal; imitation jewellery; coin	15	5.2%
30	Pharmaceutical products	14	4.9%
88	Aircraft, spacecraft, and parts thereof	12	4.1%
39	Plastics and articles thereof	7	2.5%
29	Organic chemicals	6	2.0%

Note. Data from International Trade Centre.

Europe’s imports from China

Remarkably, just two commodities make up for more than half of Europe’s imports from China. Electrical machinery and equipment with a trade value of USD 168 billion hold 29.1% of the total imports, while machinery and mechanical appliances with a trade value of USD 124 billion comprise the 21.5%.

Telephone sets and mobile phones are the main sub-commodity of electrical equipment, accounting for 46% of the commodity's value with USD 78 billion, followed by monitors (including television sets) and projectors with a value of USD 11 billion. As for the machinery and mechanical appliances commodity, automatic data-processing machines (computers, laptops, tablets, etc.) stand for 47% of the total commodity value with USD 58 billion. Computer parts and accessories and printing machinery account for further USD 19 billion.

Apparel and clothing accessories make up for the third most significant commodity that Europe imports from China with 7.9% of the total imports, while footwear complement by 2.6%. Other important import commodities include toys, games, sports equipment, and furniture. Table 4.1.11 demonstrates the top ten commodities of Europe's imports from China, including their traded value in 2017 and their proportion to the total imports.

Table 4.1.11: Primary commodities of Europe's imports from China

HS Code	Harmonized Commodity Description	2017 Value (USD billion)	Share of imports
85	Electrical machinery and equipment; sound and image recorders and reproducers; parts and accessories thereof	168	29.1%
84	Machinery; mechanical appliances; nuclear reactors; boilers; parts thereof	124	21.5%
61/62	Articles of apparel and clothing accessories	45	7.9%
95	Toys, games and sports requisites; parts and accessories thereof	24	4.1%
94	Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; lamps and lightning fittings; illuminated signs, name-plates and the like; prefabricated buildings	23	4.1%
64	Footwear, gaiters and the like; parts thereof	15	2.6%
90	Optical, photographic, cinematographic, measuring, checking, medical or surgical instruments and apparatus; parts thereof	15	2.6%
39	Plastics and articles thereof	15	2.6%
29	Organic chemicals	13	2.3%
73	Articles of iron or steel	13	2.2%

Note. Data from International Trade Centre.

4.2. Logistics processes development in Europe and Asia

4.2.1. Maritime transport development

a. Port of Gwadar

Gwadar is a port city in Balochistan province located on Pakistan’s southwestern coastline, where the Arabian Sea meets the Gulf of Oman. The Port of Gwadar, a warm-water deep-sea port, is strategically positioned on key shipping routes due to its proximity to the Strait of Hormuz, the entrance to the Persian Gulf. It lies about 252 nautical miles west from Pakistan’s biggest port, the Port of Karachi, which handles about 60% of the nation's cargo (25 million tons per annum), and 95 nautical miles east from the Port of Chabahar in southeastern Iran. In May 2013, the state-owned China Overseas Ports Holding Company Limited (COPHC) took control of port operations under a 40-year lease.

The port is developed in two phases jointly by the governments of Pakistan and China under the CPEC project. The first development phase, which was completed in December 2006, involved the construction of three multipurpose berths and related port infrastructure and handling equipment. The second phase began in 2007 and is currently ongoing. The scope of each construction phase is summarized in Table 4.2.1 and a visual depiction of the two development phases is illustrated in Figure 4.2.1.

Table 4.2.1: Gwadar Port infrastructure

Phase	Infrastructure
I (2002-2006) USD 287.8 million	• Berths: 3 Multipurpose, 600 m in total (200 m each) • Capacity: up to 50,000 DWT; 12.5 m maximum draft • Approach Channel: 4.7 km long (outer channel: 206 m wide; inner channel 155 m wide) dredged to 12.5 m depth • Turning basin: 450 m diameter • Service birth: 1 x 100 m for berthing of pilots and tugs • Related port infrastructure and port handling equipment
II (2007-present) USD 932 million	• Container berths: 4 (capacity: Ultra Large Container Vessels of up to 20 m draft) • Bulk cargo terminal: 1 (capacity: bulk carriers of 100,000 DWT) • Grain terminal: 1 • Ro-Ro terminal: 1 • Oil terminal: 2 (capacity: tankers of 200,000 DWT) • Approach channel dredging to 14.5 m depth

Note. Data from Ahmad (2016) and Gwadar Port Authority.

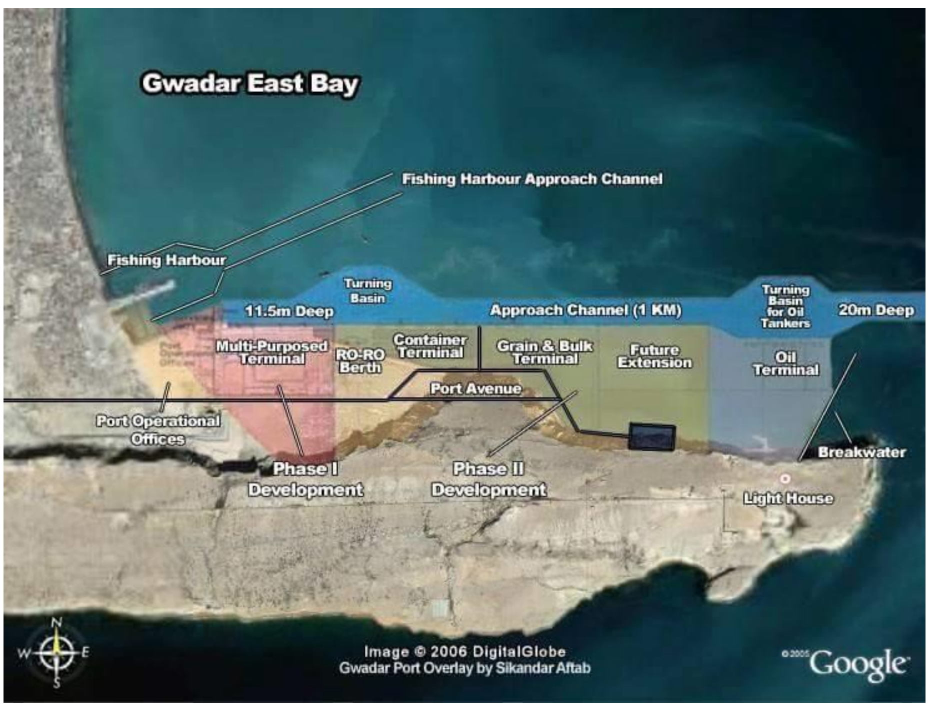

Figure 4.2.1: Gwadar Port development map overlay

Source: Sikandar Aftab

The current infrastructure status of Gwadar Port includes the Phase I enhanced by the ongoing Phase II expansions. Following additional dredging operations, the port is now 14.5 meters deep and is able to accommodate vessels of up to 70,000 DWT. The turning basin's diameter has also been widened to 590 meters and there is a Ro-Ro facility operating.

Gwadar Port's commercial shipping service started in March 2018, when state-owned Chinese shipping company COSCO introduced a weekly commercial line to Dubai's Jebel Ali port. The port currently has a handling capacity of 1.3 million tons per year and offers a wide range of facilities as presented in Table 4.2.2.

Table 4.2.2: Gwadar Port facilities

Port facilities	Description
Service vessels	• Tug boat x 2: ASD type, 2,400 horsepower • Survey boat x 1 • Working boat x 1 • Mooring boat x 1 • Pilot boat x 2
Cargo handling	• Rail-mounted Crane x 5: 2 x 40 ton - 40 m outreach, 2 x 16 ton - 33 m outreach, 1 x 10 ton - 33 m outreach • RTG x 2: 40 ton lifting capacity • Mobile crane x 2: 10 ton lifting capacity • Forklift x 12: 5 ton lifting capacity • Reach stacker x 2: 40 ton lifting capacity • Container tractor x 6: 100 kN capacity • Container semi-trailer x 4: 2 TEUs capacity • Flatbed truck x 8: 4 x 25 ton, 4 x 10 ton • Hopper x 8: 6 m x 6 m • Mobile bagging plant x 8: capacity 30 x 50 kg bags/minute • Weighing bridge x 2: 80 ton capacity

Storage	• Port Area: 640,000 m2 • Container Stacking Area: 48,278 m2 • Reefer Cargo Space: 4,367 m2 (400 Plug-In points) • Empty Container Stacking Area: 6,875 m2 • Storage Yard: 28,669 m2 • Transit Shed: 3,750 m2 • Hazardous Cargo Storage Yard: 1,800 m2 • Future Development Area: 120,210 m2
General services	• Online custom clearance facilities (WeBOC) • VHF/DSC including INMARSAT-B • Specialized/Tailor-made stevedoring services • Bunker & fresh water supplies (desalination plant supplying 380 cubic meters of drinking water per day) • Ship chandler services

Note. Data from Gwadar Port Authority and COPHC.

The port's capacity is projected to increase to 13 million tons per year by 2022 and once the development is fully completed, Gwadar port's capacity will be 300 to 400 million tons of cargo annually. To put that into perspective, India's 212 ports have a current combined capacity of 500 million tons of cargo per year.

The Port of Gwadar will also offer a Special Economic Zone with a permanent tax and duties exemption. The free zone will cover 9.24 square kilometers and will be developed in three stages. The SEZ facilities include bonded warehouses, processing and manufacturing areas, value added logistics (assembly, packaging, labeling, etc.), stuffing, de-stuffing and transshipment, and supporting services (onsite customs, financial institutions, information center, retail outlets, hotels, restaurants, entertainment amenities, medical facilities, etc.).

The first section of the zone was inaugurated in January 2018, with COPHC announcing that more than 30 firms, related to banking, fish processing and hospitality, have already committed to around USD 500 million of direct investments in the zone. The second and third stage of the development is expected to be completed by 2020 and 2025 respectively (Figure 4.2.2).

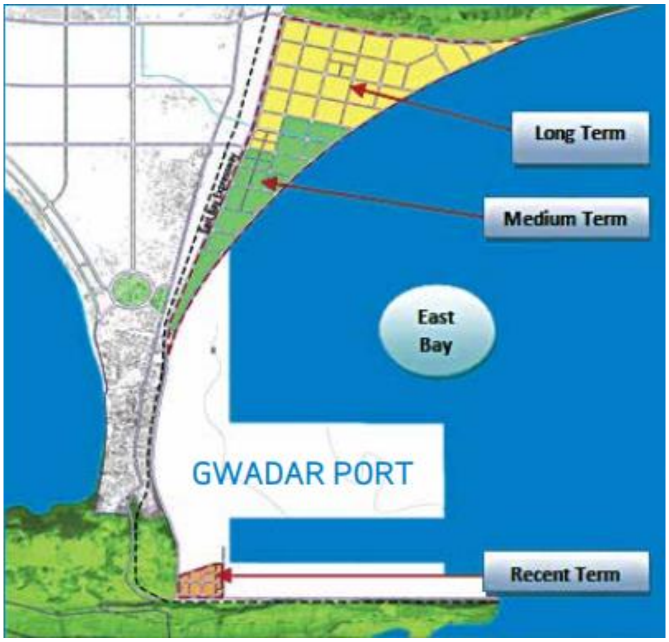

Figure 4.2.2: Gwadar's Special Economic Zone

Source: COPHC

Gwadar Port's development will directly benefit Balochistan province as about 40,000 jobs will be created and contribute to the boost of Pakistan's economy. The country's GDP is growing at a 5% rate since the commence of the CPEC project in 2015 (Table 4.2.3).

Table 4.2.3: Evolution of Pakistan's GDP

Year	2013	2014	2015	2016	2017	2018
Nominal GDP in USD billion	225.9	254.7	269.6	277.5	304.7	283.0
Real GDP growth rate	3.68%	4.05%	4.06%	4.56%	5.37%	5.79%

Note. Data from Pakistan Bureau of Statistics.

b. Port of Piraeus

Similarly to Port of Gwadar, the Port of Piraeus is another strategically positioned port operated by a Chinese state-owned company and which is expected to play a key role in the new Maritime Silk Road. Back in 2008, COSCO Pacific Limited won the tender of the concession to operate Piers II and III of Piraeus Port for 35 years with a winning bid of EUR 4.3 billion. The deal also included the commitment of further investment by the Chinese company of EUR 620 million in upgrades, including infrastructure upgrade of Pier II and construction of Pier III. The agreement was signed in late 2008 and in October 2009 COSCO Pacific's wholly-owned Greek subsidiary, Piraeus Container Terminal S.A. (PCT), was established and took over the operation of the two piers in June 2010. Furthermore, in 2016 COSCO Shipping (Hong Kong) Co. Limited obtained 67% stake of Piraeus Port Authority S.A. (PPA) shares through a tender process.

The tremendous interest shown by China in the Port of Piraeus only confirms its great geopolitical significance. The port literally lies at the crossroads of Asia, Africa and Europe and it is the first European port after the Suez Canal. It is a naturally deep port which is able to accommodate the latest generations of container ships and with sufficient hinterland connections it could replace the Northern European ports as the central gateway for Euro-Asian trade, enabling ships to avoid sailing all the way around the European continent to the northern ports. Naturally, this would not only result to time savings for the shipping lines, but also to reduction of the voyage's costs.

In 2018, Port of Piraeus has a total handling capacity of 7.2 million TEUs per annum from 2.4 million in 2008. PCT has completed the upgrades in Pier II doubling its capacity from 1.6 million to 3.2 million TEUs and the completion of Pier III construction increased the port's capacity by 3 million TEUs. Pier I, which is operated by PPA, has also been expanded and its capacity has increased from 0.8 million to 1 million TEUs. Table 4.2.4, Table 4.2.5 and Table 4.2.6 present the current infrastructure specifications of the three container terminals of Piraeus Port.

Table 4.2.4: Piraeus Port Pier I terminal specifications

Pier I	East Side	West Side
Operational Quayside	500 meters	320 meters
	820 meters total	
Safe draft / Depth	18 meters	12 meters
Quay Cranes	4 x Super-Post-Panamax (SPP)	4 x Panamax
RMGs	8 RMGs	
Reefer Points	144 reefer sockets	
Capacity	1 million TEUs	

Note. Data from Piraeus Port Authority.

Table 4.2.5: Piraeus Port Pier II terminal specifications

Pier II	East Side	West Side
Operational Quayside	780 meters	700 meters
	1,480 meters total	
Safe draft / Depth	14.5 meters	16.5 meters
Quay Cranes	10 QCs: 2 x Super-Post-Panamax (SPP) & 8 x Post-Panamax (PP)	8 QCs: 4 x Super-Post-Panamax (SPP) & 4 x Post-Panamax (PP)
RMGs / E-RTGs	16 E-RTGs	16 semi – automated RMGs
Reefer Points	760 reefer sockets	
Capacity	3.2 million TEUs	

Note. Data from Piraeus Container Terminal SA.

Table 4.2.6: Piraeus Port Pier III terminal specifications

Pier III	East Side	West Side
Operational Quayside	600 meters	800 meters
	1,400 meters total	
Safe draft / Depth	18.5 meters	19.5 meters
Quay Cranes	5 x Super-Super-Post-Panamax (SSPP)	7 x Super-Super-Post-Panamax (SSPP)
RMGs / E-RTGs	6 semi – automated RMGs	22 E-RTGs
Reefer Points	1,360 reefer sockets	
Throughput	3.0 million TEUs	

Note. Data from Piraeus Container Terminal SA.

The new era for Port of Piraeus under the concession of operations to COSCO Pacific had an immediate effect on the port's throughput, bringing about significant increases. The port handled a total of 4.06 million TEUs in 2017, which is a 511% increase compared to the 0.67 million it handled in 2009, the year before PCT took over (Table 4.2.7). Even if we compare the current throughput to the throughput the port had before the continuous strikes it suffered in 2008, which led to a huge decline of port calls and consequently of throughput, the increase is still phenomenal; 196% more TEUs handled in 2017 in comparison to 1.37 million TEUs in 2007.

Table 4.2.7: Evolution of Port of Piraeus' throughput

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017
'000 TEUs	665	850	1,681	2,815	3,199	3,493	3,360	3,736	4,060
% change	-	28%	98%	67%	14%	9%	-4%	11%	9%

Note. Data from Eurostat.

c. New shipping routes

The integration of new nodes in the existing system of sea routes is projected to have a significant impact on transportation developments. The Chinese focus on developing the ports of Piraeus and Gwadar reveals the vision to create a new shipping route between Europe and Asia, with Port of Piraeus acting as the gateway for the New Silk Road into Europe, and Port of Gwadar acting as an alternative to the Chinese ports in the Far East.

The distance from Shanghai Port to Piraeus is 3,050 nautical miles less than the distance to Rotterdam, which with the optimal slow-steaming speed of 16 knots would take almost 8 days less to sail, from 31.2 days for Port of Rotterdam to 23.3 days for Port of Piraeus. Moreover, in case the Port of Gwadar would replace the Eastern Chinese ports as the port of origin, the transit time would be further reduced to 9.7 days (Table 4.2.8). In other words, the new sea route would take one third of the time to sail. Such a significant reduction in the sailing distance from Asia to Europe would not only mean reduced operational costs per voyage, but also reduced vessel turnaround time, which would consequently translate into less vessels operating on the route.

As far as the shipping route from the Middle East to China is concerned, the distance of 6.6 thousand nautical miles requires at least 17.5 days of sailing (with an average speed of 16 knots). Gwadar Port lies just 474 nautical miles further from Middle East's biggest port, Jebel Ali in United Arab Emirates, and transit time is 1.2 days at slow-steaming speed (Table 4.2.8). Thus, using Gwadar Port as the gateway for oil imports from the Middle East would result to extraordinary time savings, as the oil would be further transported to China by means of the Gwadar – Kashgar pipeline.

Table 4.2.8: Comparison of the current and future sea routes

	Current service (Port of Shanghai)		Future service (Port of Gwadar)	
China sea route to	Distance (nautical miles)	Transit time (days)	Distance (nautical miles)	Transit time (days)
the Middle East (Port of Jebel Ali)	6,627	17.3	474	1.2
Mediterranean Sea (Port of Piraeus)	8,949	23.3	3,736	9.7
Northern Europe (Port of Rotterdam)	11,999	31.2	6,784	17.7

Note. Distance data from www.ports.com. Transit time calculations by author.

4.2.2. Land transport development

a. Hinterland connections for BRI key ports

Port of Gwadar

In the short term, Port of Gwadar will not have direct connection with rail service and the cargo will require road transportation up to Karachi, 626 kilometers to the East, where it will be transloaded from road to rail. The rail service will follow a 2,635 kilometer route through Karachi – Taxila Junction – Havelian Dry Port – Khunjerab Junction (at the Pakistan-China border) where it will link with China's Kashgar – Hotan Railway. In 2018, the current active line end at Havelian Dry Port station and the construction of the extension to Khunjerab Pass and Kashgar will be part of the second phase of CPEC.

The total duration of the transportation from Gwadar Port to Kashgar will be 30.3 hours (Table 4.2.9), excluding cargo handling time, transloading time in Karachi, border crossing delays, dwell times, etc.

Table 4.2.9: Short term route connecting Gwadar Port to Kashgar, China

Route	Mode	Distance (km)	Speed (km / h)	Transit time (hrs)
Makran Coastal Highway (Gwadar - Karachi)	Road	626	120	5.2
Karachi - Peshawar Line (up to Taxila Junction)	Rail	1,535	105	14.6
Taxila - Havelian Dry Port	Rail	68	105	0.6
Havelian Dry Port - Khunjerab Junction [1]	Rail	682	105	6.5
Khunjerab Junction – Kashgar [1]	Rail	350	105	3.3
TOTAL		**3,261**		**30.3**

Note. Data compiled from Pakistan Railways and Google Maps. Transit time calculations by author.

.[1] construction scheduled during the second phase of CPEC between 2018-2022.

Nevertheless, the long term plan of CPEC includes the rail connection of Gwadar Port with the main rail system of Pakistan. The plan for the new track is to be constructed from 2025 to 2030 and it will connect Gwadar with Jacobabad via Central Balochistan on a 1,206 kilometer route. The total length of the rail service from Gwadar Port to Kashgar will be 3,264 kilometers. With the introduction of high-speed trains, which is another long term plan under the CPEC, the distance will be possible to be covered in 20.4 hours (Table 4.2.10).

Table 4.2.10: Long term route connecting Gwadar Port to Kashgar, China

Route	Mode	Distance (km)	Speed [2] (km / h)	Transit time (hrs)
Gwadar - Jacobabad Railway [1]	Rail	1,206	160	7.5
Karachi - Peshawar Line (from Jacobabad to Taxila Junction)	Rail	958	160	6.0
Taxila - Havelian Dry Port	Rail	68	160	0.4
Havelian Dry Port - Khunjerab Junction	Rail	682	160	4.3
Khunjerab Junction – Kashgar	Rail	350	160	2.2
TOTAL		**3,264**		**20.4**

Note. Data compiled from Pakistan Railways and Google Maps. Transit time calculations by author.

[1] long term project envisioned for 2025-2030.

[2] long term target high-speed train up to 160 km / h.

Port of Piraeus

As far as the Port of Piraeus is concerned, rail service to the Balkans and Central Europe has been operating since 2014, linking the port with inland destinations such as Slovakia, Hungary, Czech Republic, Poland and the Balkan countries. Piraeus Port offers shuttle service with regular departures per week (Table 4.2.11), but also dedicated block train service, customized on customer needs. Each train can accommodate up to 76 TEUs.

Table 4.2.11: Shuttle train service from Piraeus Port to Central Europe and Balkans

Destination	Departures	TAT (days)	Routing
Bratislava, SK	1 / week	5	GR-MK-RS-HU-SK
Budapest, HU	4 / week	4	GR-MK-RS-HU
Belgrade, RS	2 / week	2	GR-MK-RS
Skopje, MK	1 / week	1	GR-MK

Note. Data from COSCO SHIPPING Lines (Greece) S.A.

HP was the first company to use the dedicated block train service from Piraeus for distribution to the Balkans, Hungary, and the Czech Republic, relocating this part of its distribution operations from Rotterdam, followed by Chinese telecommunication companies ZTE and Huawei, which also use the Port of Piraeus as their European gateway. Furthermore, HP and PCT have agreed to increase the annual rail operation to 10,000 block trains (equivalent to 760,000 TEUs per year) from Greece to the Czech Republic by 2020. Currently, it takes 3-4 days to reach Budapest and 4-5 days to reach Prague (Figure 4.2.3).

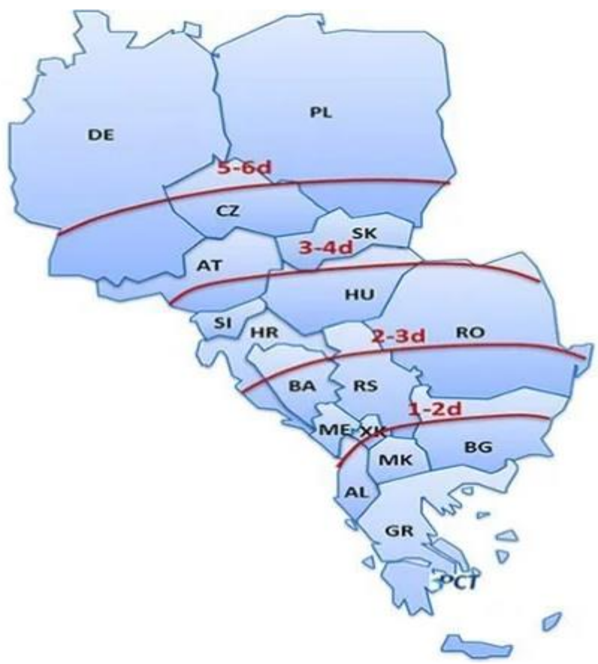

Figure 4.2.3: Turn Around Time from PCT to Central Europe in days

Source: COSCO SHIPPING Lines (Greece) S.A.

b. Eurasian Land Bridge

China – Europe rail service

March 2011 marked the launch of the first freight train service connecting China with Europe, China – Europe Railway Express (CR Express), when the first freight train departed from Chongqing and arrived in Duisburg, Germany, two weeks later. The train carried products of major IT companies, such as Hewlett-Packard, Asus, Acer and Toshiba, which had recently established their manufacturing bases in the area. The growth of the China – Europe rail service within the last seven years is memorable.

Year after year the number of train trips and cargo volumes rise exponentially in three-digit figures (Table 4.2.12). Particularly after the announcement of the BRI in late 2013, the service has grown decisively and inbound services (from Europe to China) are eventually launched. Last year 1,225 trains travelled eastbound carrying products from Europe to China, up from just 28 in 2014, the first year of inbound service. However, this corresponds to only half of the rail services offered on the westbound direction. Recording a 774% increase over 2014, the first year under the BRI, and a 117% increase over 2016, the service from China to Europe offered 2,448 westbound train trips.

Each train can transport 40-50 FEUs (equivalent to 80-100 TEUs). According to CR Express, 95% of the freight transported on China – Europe trains are forty-foot containers, mainly due to the fact that for safety reasons twenty-foot containers have to be loaded in pairs of matching weight on the flat wagons, which is rather challenging to achieve. On that account, consolidation services for LCL cargo (Less than Container Load) are offered for shippers that do not have sufficient volume to book a full forty-foot container (FCL).

Table 4.2.12: China – Europe rail trips and volumes

Year	2011	2012	2013	2014	2015	2016	2017
from China to Europe							
Number of trains	17	42	80	280	550	1,130	2,448
TEUs [1]	1,530	3,780	7,200	25,200	49,500	101,700	220,320
from Europe to China							
Number of trains	-	-	-	28	265	572	1,225
TEUs [1]	-	-	-	2,520	23,850	51,480	110,250
Total traffic							
Number of trains	17	42	80	308	815	1,702	3,673
TEUs [1]	1,530	3,780	7,200	27,720	73,350	153,180	330,570
Growth rate (%)	-	147%	90%	285%	165%	109%	116%

Note. Data for number of trains from China Railway Express. TEU calculations by author.

[1] *Calculation based on average 45 FEUs (90 TEUs) per train.*

Khorgos Gateway

Khorgos Gateway dry port is considered one of the most significant logistics projects in the Eurasian Land Bridge. Located at the border of Kazakhstan with China and with a projected throughput capacity of 500,000 TEUs per year, the dry port aims to become the main crossing point for freight trains from and to China.

As a former Soviet Union country, Kazakhstan uses the wider five-foot rail track gauge (1,520 mm), while China uses the standard West European rail track gauge (1,435 mm). As a result, cargo needs to be transshipped from the narrow to the wide gauge at the border. Khorgos Gateway offers container transshipment between trains by employing three fully automated 41-ton RMG cranes which lift the containers from the Chinese rail cars and load them onto wide-gauge ones (Figure 4.2.4). The train will have to change back to standard gauge at the Belarus – Poland border, after having crossed through Kazakhstan, Russia and Belarus on the wide-gauge rail track.

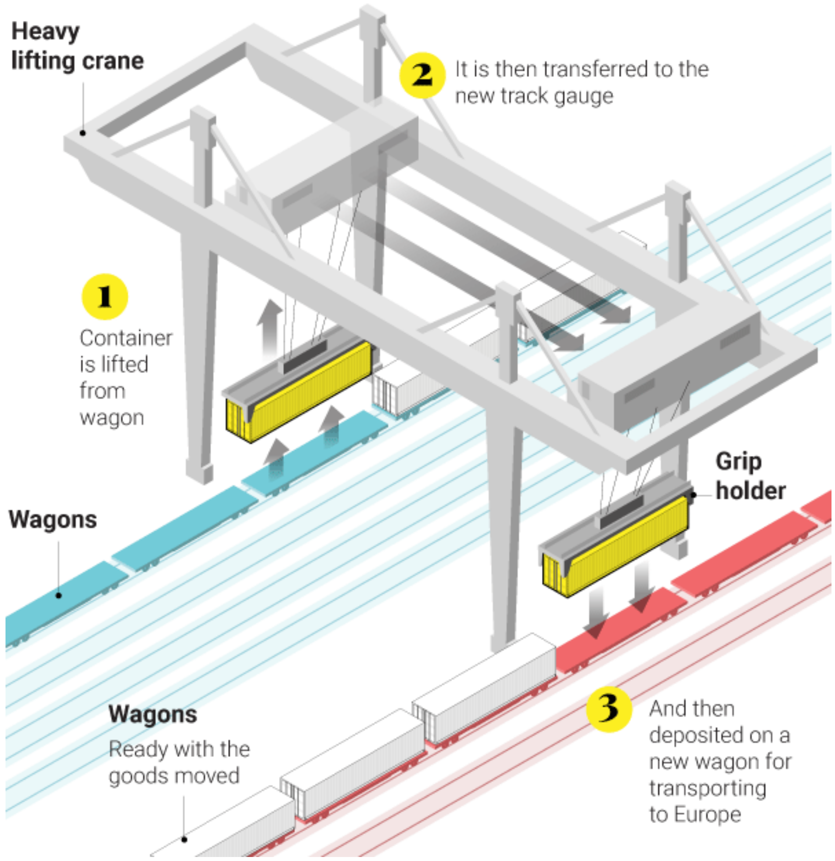

Figure 4.2.4: Change of gauge operations at Khorgos Gateway dry port

Source: South China Morning Post

Table 4.2.13 illustrates the infrastructure and facilities of Khorgos Gateway dry port.

Table 4.2.13: Khorgos Gateway dry port facilities

Dry Port facilities	Description
Rail terminal	25 km long access railway tracks of standard and wide gauges
	6 x loading / unloading positions: 3 x standard gauge & 3 x wide gauge; 1,050m length each (sufficient to accommodate 50-wagon container trains)
	3 x fully automated RMGs HDHM: lifting capacity 41 tons

Container yard	capacity 18,000 containers per day	
	6 x Reach stackers DRT450 Kalmar	
	2 x Empty Handlers DCT80 Kalmar	
	7 x ITVs with 10 trailers Kalmar	
	4 x RTGs HDHM	
	25 x Forklifts Toyota	
Storage	2 warehouses of 5,000 m^2 each, including 700 m^2 of climate control chambers	
	180 reefer sockets	
	Over-sized cargo terminal	
	Explosives and dangerous cargo terminal	

Note. Data from KTZE – Khorgos Gateway LLP.

Railway infrastructure development

Railway infrastructure is of great importance to the Chinese economy. Due to the country's vast land area, difficult terrain and fluctuating weather, rail is one of the most efficient and reliable modes of transport. China is committed to expanding its railway network, and thus invests a substantial proportion of its GDP in railway infrastructure. The years following the BRI announcement, China has spent CNY 809 billion on average per year on rail infrastructure investments, an amount which accounts for about 7.4% of its GDP. Table 4.2.14 presents the Chinese investments in rail development from 2012 to 2017 in Yuan and US Dollars.

Table 4.2.14: Investments in China's rail infrastructure

Currency	2012	2013	2014	2015	2016	2017
CNY billion	633.97	665.75	808.8	823.8	801.5	801
USD billion	95.10	99.86	121.32	123.57	120.23	120.15

Note. Data in Yuan from Statista. USD conversion by author on the basis of 1 Yuan = 0.15 USD (July 2018)

The year-on-year increase of the total operating length of railways is indicative of the Chinese focus on rail development (Table 4.2.15). In just 5 years since 2012, roughly 30,000 kilometers of new tracks have been laid, expanding the rail network by 30%.

However, the freight traffic does not follow this growth accordingly. To the contrary, rail freight volumes have decreased during the recent years. That is mainly due to the decreasing trade volumes of heavy goods, such as coal, which used to be the financial pillar of the rail industry. China's target to reduce emissions and air pollution and shift to cleaner energy resources has led to the decrease of coal demand, and thus to the decrease of the rail transported volumes.

Table 4.2.15: China rail transport development indicators

China Rail Indicator	2012	2013	2014	2015	2016	2017
Operating length of Railways (1,000 km)	97.6	103.1	111.8	121	124	127
Freight Traffic of Railways (million tons)	3,904	3,967	3,813	3,358	3,332	3,689

Note. Data from National Bureau of Statistics of China.

Kazakhstan has a crucial role in regard to the rail transportation development across the Eurasian Land Bridge. Essentially, due to the fact that geographically it occupies a large amount of land on the crossroads of Asia and Europe, it offers two major border-crossing rail links along the border with China, the Dostyk (Kazakhstan) – Alashankou (China) crossing and the Altynkol (Kazakhstan) – Khorgos (China) crossing.

Since the announcement of the OBOR initiative, Kazakhstan has increased its operating railway length by 1,300 kilometers. The rail freight traffic has also increased by 31.6%, from 294 million tons in 2013 to 387 million tons in 2017 (Table 4.2.16).

Table 4.2.16: Kazakhstan rail transport development indicators

Kazakhstan Rail Indicator	2012	2013	2014	2015	2016	2017
Operating length of Railways (1,000 km)	15.3	15.3	15.3	15.3	16.1	16.6
Freight Traffic of Railways (million tons)	295	294	391	341	339	387

Note. Data from Ministry of national economy of the Republic of Kazakhstan – Committee on statistics.

5. DISCUSSION

Although not entirely reflected in the nominal figures and trend lines (due to the appreciation of the US dollar), the BRI appears to have a positive effect on trade between Europe and Asia. Especially with regard to trade between Europe and China, trade values have been rising over the past years. China has been reinforcing its economy, establishing a more powerful position in Asia and globally. Increased trade values are translated into increased demand for goods, and thus increased need for transportation and logistics services.

The BRI has also brought new opportunities for improved and advanced transportation options. The last decade has been prominent for the rise of rail in the logistics processes between Europe and Asia. Sea freight has become even slower due to slow-steaming practices and air freight particularly expensive due to the increase in fuel prices, opening up new opportunities for rail transport. Coinciding with the manufacturing industry of China moving to the west of the country in order to take advantage of low-cost labor, rail forms an appealing alternative for shipping goods in a timely and economical manner.

Particularly with rail transit times from China to Europe consistently being reduced, rail freight is able to directly compete with air freight, posing a growing threat to air cargo. Furthermore, modal shift from sea freight to rail could also begin to gradually increase, since the rail freight rates are declining as rail continues to develop.

Even if rail freight rates never manage to reach the low levels of sea freight, the advantages from shifting from sea transport to rail may still be significant and lead to reduced overall costs. Lower transit times equal faster stock replenishment, and, therefore, lower inventory costs since order fulfillment is facilitated in a just-in-time fashion. Furthermore, for goods shipped directly to the customer, faster transit times translate into faster payments, and consequently to increased cash flow.

Chinese exports to Europe have a serious potential for increased benefits from the use of rail transport instead of sea transport, despite the shipping costs being more expensive. A large proportion of Chinese exports to Europe may be classified as either high-value goods, or time-critical goods. Electronic products, such as mobile phones, laptops and tablets, are normally high-value low-volume goods, thus a container is able to accommodate a significantly large number of high-value products. This results in the total freight cost being split among hundreds of individual products. Since the specific products have a high item value, the additional cost to each item's shipping cost from using rail instead of sea transport, will be a small fraction of its total value.

Apart from the opportunities deriving from rail transport, the BRI will also offer new options with regard to sea transport. The emerging Port of Gwadar in Pakistan will act as a new outlet from Asia to Europe, facilitating an alternative sea route with shorter transit times. Especially in the case of using Piraeus Port as the gateway to Europe the total transit time is further reduced.

By way of illustration, Table 5.1 presents the comparison of transit times between the existing and new shipping routes for a shipment from the Chinese city of Chongqing to the European city of Prague. Shipping via the new sea route is going to be approximately two weeks faster than the existing one, while using rail transportation is 3 weeks faster than the existing service via Shanghai and Rotterdam ports.

Table 5.1: Transit time comparison of different shipping options from Chongqing to Prague

Shipping option	Delivery to Port of Origin	Sea transit	Port of Destination to final consignee	Total transit time
Existing sea route (via Shanghai and Rotterdam)	2 days	31 days	3 days	36 days
New sea route (via Gwadar and Piraeus)	7 days	10 days	5 days	22 days
Rail transport		-		14 days

Note. Author's compilation from research findings.

The geography of the different shipping routes is depicted on the following map (Figure 5.1), illustrating Chongqing as the origin point and Prague as the destination point.

Figure 5.1: Map of existing and new shipping routes from China to Europe

Source: Author's creation from research findings

6. CONCLUSION

Although the Belt and Road initiative is a relatively young project, there are already evident signs that it has affected the logistics processes between Europe and Asia. The striking development of rail services between China and Europe in such a short time period is a significant indication of that. However, the BRI is under an ongoing process of development and still far from reaching its full potential. For instance, the Port of Piraeus is increasing its throughput year-over-year, but thus far has not reached its full capacity. Similarly many OBOR projects are still under development, or even still in their planning phase.

This research explored a variety of aspects of the BRI and has presented its most prominent developments, illustrating not only the current effects on the transportation and logistics sector, but also providing suggestions of how the future of the BRI is projected to develop. The research adopted this global approach to the subject, intending to provide a rich understanding of the overall structure and processes behind the initiative.

The BRI is naturally vast with undefined limits of application and without a central coordination mechanism, so the quantification of its impact at its full extent is practically beyond the bounds of possibility, for the time being. As the projects under the initiative's scope mature and more data become available, the possibilities for more quantitative research on the effects of the initiative will increase. Nevertheless, within a limited period of time since the initiative was first announced and despite the fact that the majority of the OBOR projects remain incomplete, it becomes apparent that the Belt and Road initiative has the potential to fully reshape the logistics landscape of the Eurasian continent.

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