



# **Impact of China Pakistan Economic Corridor**

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<p><b>Abstract:</b></p> <p>The work of this thesis primarily revolves around the concept of logistics' shipping cost and transit time. China needs a short, safe and inexpensive trading route to European and Middle Eastern countries. The aim of the study is to verify if CPEC is a viable solution to the need. The study analyzes the impact of China Pakistan Economic Corridor (CPEC) on trade in terms of the shipping costs and transit time. Transport and infrastructure are called strategic levers of trade as they help in reducing the shipping costs and transit time. In the modern era, organizations want to reduce the shipping costs and transit time to maximize profit and ensure timely delivery of product. The focal point of the thesis is to study the importance of CPEC and its impact on import and export in terms of costs and transit time. Besides, this study compares existing route with proposed route. The research methodology used in the study follows qualitative and descriptive approach.</p> <p>In this study, dry port Kashgar (western China) has been taken as origin and three ports of each European and Middle Eastern countries are taken as destinations. The destination ports which have been selected in this study are key trading players with the port of origin. The selected European ports (Hamburg, Le Havre and Rotterdam) share huge trading volume with China. The selected Middle Eastern ports (Jeddah, Kuwait and Oman) fulfil Chinese energy requirements.</p> <p>In the first step, the variables (transit time and shipping cost) of 40-foot container are calculated when transported using current route. In the second step, the same variables are calculated using proposed route (CPEC). In the third step, both variables are compared for current and proposed route. Although it's difficult to calculate the exact future road transportation cost (in case of CPEC), so this study considers average value of current road transportation cost. The results show that shipping costs will drop drastically if proposed route is used. The shipping costs between Kashgar and destination ports can decrease by 36% for European ports, 50% for Jeddah and Kuwait and 68% for Oman. Also, the transit time will decrease by 10-11 days for European ports, 11-13 days for Jeddah, 15-18 days for Kuwait and 10 days for Oman.</p>	
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# Abbreviations & Definitions

- CPEC :China Pakistan Economic Corridor
- CR :China road (Distance between Kashgar (western China) to Shanghai)
- CS :China sea (Distance between shanghai to selected destination ports)
- PR :Pakistan road (Distance between Kashgar to Gwadar (Pakistan))
- PS :Pakistan sea (Distance between Gwadar to selected destination ports)
- Haulage charges :Charges from dry port to sea port (road transport)
- Transit time :Time between port of origin to port of destination

# 1 INTRODUCTION

Pakistan is located at a region which is strategically important for world trade. It is the gateway of Central Asia and Middle East and plays a significant role in transit economy. It provides the shortest link to China for Middle Eastern and European countries. China relies heavily on Middle Eastern nations to fulfil its energy requirements. It has planned to invest \$46 billion for CPEC, which will help in reduction of its shipping cost and delivery time. This is one of the big investments China has ever done in a foreign country. The current trade route from China to Europe and Middle Eastern countries is expensive, long and unsafe.

## 1.1 Overview

This topic preliminary revolves around the importance of delivery time and cost of transportation in logistics. Logistics is concerned with the delivery of finished products to the customer. It includes the activities of order processing, warehousing, and transportation. It is the activity of supply chain network that involves the integration of different sectors, including: information, transportation, and inventory, warehousing, material-handling, and packaging. It's an activity that organizes the movement, equipment, commodity, troops and other things as well. In commercial prospects, logistics includes all the activities that move the goods from point of production to point of consumption. Logistics has two main parts. The first part is transport, for example, vehicle either its truck, van, rail, ships, airplane and second most important part is infrastructure on which transport runs smoothly, for example, roads, highways, sea ways, air ways. In the current era, both parts of logistics are called strategic levers of trade and help in reducing shipping cost and delivery time.

Transportation is an important activity of logistics. The selection of transportation mode for the movement of goods is important. Organizations try to evaluate different attributes of transportation for mode selection. Only cost and transit time are considered as primary attributes out of all available ones. (Meixell, Norbis, 2008). The focal point of



the thesis is to study the importance of CPEC and its impact on import and export in terms of costs and transit time.

## **1.2 Description and Motivation**

This topic is motivated by the fact that companies prefer such a mode of transportation which is fast, reliable and cheap. The aim of the CPEC is to connect the Gwadar port of Pakistan and Kashgar port which is a major trading hub in Western China. Currently, more than 70 % of Chinese trade is undertaken using Indian Ocean route. This route passes from pirate-swarmed Strait of Malacca. The route is patrolled by U.S and Indian navies to protect the cargo ships from pirates. If any conflict arises, it will cut off the energy supply to China. This project reduces the trading route by more than 10,000 kilometers. Instead of 45 days, it would take China a mere 10 days to get its imports and also for exports as well. China can deliver products in mere 10 days compared to current transit time i.e. 45 days. The project allows China to avoid any potentially contested channels near Taiwan, Vietnam, the Philippines, Indonesia and India, and eventually less transit time and lowering shipping costs. (Chowdhary 2015).

Companies use different modes of transportation to reduce delivery time and shipping cost. It is very difficult to optimize both delivery time and shipping costs at the same time. If company wants to reduce the delivery time, e.g. uses airways, then shipping cost increases sharply.

Each country tries its best to find short trade routes which can minimize the shipping costs and delivery time. Countries invest in infrastructure such as roads, rails and pipelines for enhancing their trade. The infrastructure is an important element. Adequate infrastructure can potentially reduce the delivery time and shipping cost.

## **1.3 Research aim**

The research objectives of the study are to find the impact on trade in terms of transit time and shipping costs. The study recommends cost and time efficient route.

China needs an alternative trading route for European and Middle Eastern countries which is short, inexpensive and safe. The aim of the study is to verify if CPEC is a viable solution to the need. CPEC can provide shortest link from China to European and Middle eastern countries. It will provide easy access to Middle East from China. It has the potential to make a remarkable impact on global trade.

This study calculates and compares the shipping costs and transit time of 40-foot container when transported via current route and proposed route.

## **1.4 Research Question**

The research questions of the study

- Is there any positive or negative impact on imports and exports in term of shipping costs and delivery/transit time?
- Which route is efficient in terms of shipping costs and delivery/transit time?

## **1.5 Research Design**

Research design includes the detailed information about the data & its source, research approach employed, technique used for data analysis and interpretation of data to answer the research questions.

### **1.5.1 Material**

Material in the secondary data that has been taken from different sources including Internet, articles, newspaper and books. Primary data, such as shipping cost and current delivery time, has been taken from shipping lines and freight forwarders. Both current and proposed routes are based on road and sea. Sea transportation cost is taken from different shipping companies and road transportation cost is calculated using data gathered from Internet and freight forwarders.

### **1.5.2 Approach**

The primary data (shipping cost) has been collected from shipping companies and freight forwarders via email. The sea transit time is taken from live vessels schedule of CMA line's website. The distance of the road route is retrieved using Google maps.

### **1.5.3 Data collection**

**Primary data:** It is collected from shipping companies including CMA-CGM, MSC, China shipping, Hapag Lloyd and freight forwarders including AW logistics and Combined freight.

**Secondary data:** It is collected from Internet (including Google maps), research publications, newspapers and books.

### **1.5.4 Data analysis**

Qualitative and descriptive research approach is used to answer the research questions of the thesis. A comparative analysis has been done for both current and proposed routes. Variables like total distance, shipping costs and transit time have been used in the comparative studies.

### **1.5.5 Data interpretation**

Shipping cost, transit time and total distance are the key variables to interpret the cost and time efficiency of the route. If calculated values of above mentioned variables of the proposed route are lower than the current route, then it means that the proposed route has a positive impact on trade. However, if the calculated values of the variables are higher, then the proposed route has a negative impact on trade. Comparison of current and proposed routes eases selection of route.

## **1.6 Limitation of Study**

CPEC project is under construction so it's difficult to collect the exact data for example: road transportation cost and time. The shipping companies provided the shipping costs

of 40-foot container which is generally valid for one month. The cost may increase or decrease depending upon various factors including: oil prices, demand and supply of products.

Both current and proposed routes are comprised of two parts: road part and sea part. It's relatively easy to estimate shipping costs and transit time of sea part. However, it's a challenge to do same for road part. The road transportation charges may vary because different local road transporters charge differently. The study has taken into account an average road transportation cost so as to meet the research requirements.

Gwadar port is not yet operative so Karachi port is used for fulfillment of research requirements. Both ports are close and have similar shipping rates for sea transportation and transit time.

## **2 LOGISTICS (THEORETICAL FRAMEWORK/ LITERATURE REVIEW)**

This project is related with logistics and supply chain network. Its main aim is to check the impact of CPEC on Chinese imports and exports supply chain in term of shipping cost and transit time. This chapter builds the theoretical framework that establishes the importance of shipping cost and transit time in SCM.

Logistics term came into use in 1960s and nowadays it is widely used. But still it has been in the position of continues changing. (McGinnis, 1992). Logistics is the chain of different activities that help to move the product from the point of origin or production to the point of consumption. Logistics is the integration of different important activities such as information, warehousing, inventory, packaging, material handling and many others as well. Logistics is the part of supply chain that deals with the forward and reverse flow of goods. (CSCMP). Logistics is the activity that connects the different function of supply chain. Logistics is important activity and it will impact on all other function of supply chain. Efficiency of logistics depends upon the Infrastructure and organizational network. Infrastructure network includes the different points and activities (lo-

gistics centers, warehouses, stations, docks, aviation ports etc.) and lines (railways, highways, waterways, flight courses, pipelines).

On the other hand, logistics organization network includes component elements materials supply enterprises, transport enterprises, target customers. (Zhang, et al, 2011). As mentioned by (Shan et al, 2011), logistics efficiency depends upon the infrastructure. It means logistics' efficiency should improve by using short routes or with better infrastructure. In the current era, logistics become a competitive advantage for the firm. (Bowersox et al., 2000).

Organization create values for customers and for themselves by developing new logistics capabilities. (Esper et al., 2007; Mentzer et al., 2001). Logistics is an opportunity for the firms. In many firms logistics is undervalued and consider as cost center but not as a strategic resource. However, logistics is a strategic resource and organization used it as competitive advantage. (Mentzer et al., 2004).

Transportation takes a crucial part in manipulation of logistics. Since logistics have advanced from the 1950s due to the trend of nationalization and globalization in recent decades, the importance of logistics management has been growing in various areas. For industries, logistics helps to optimize the existing production and distribution processes. (M.Sreenivas, 2008).

## **2.1 Supply Chain**

A supply chain is the system or network of organization that consist on different people, activities that move the product from the point of production to point of consumption by utilizing the existing available resources. Supply chain consists on manufacturers, Suppliers, distributors, retailers, wholesaler and other, interconnected by the transportation system. The main aim of supply chain network is to provide goods and services to end customer. Effective integration of all the business functions and stakeholders of supply chain network enable the success of supply chain network. (Sahin, 2002)

The term “supply” as used in “supply chain management” word used as a noun or verb. If its use as verb than its mean “to provide for” and if this word used as noun than its mean “the act of filling a want or need”. The second term “chain” refers to “parts of metal that links which each other” in other words chain refers to “series of people activity and other thing that connected to each other for some purpose” (Merriam-Webster, 1973)

The term “supply chain management” was first used by Keith Oliver, a Booz Allen Hamilton executive in 1982 (InformationWeek, 2003). Supply chain management means managing the function or activities that are working together in a chain of supply.

In recent era, organization tries to improve the supply chain flow and take supply chain as source of competitive advantage. Organizations are heavily invested to make software for making the supply chain flow smooth. From 1999 to 2002 different software organization sold more than \$15 billion in supply chain management (SCM) software licenses. It is only the cost of software not the installation and maintenance. (Kanaka-medala et al., 2003).

Supply chain have different function or in other words supply chain is the group of firm that engaged in different activities of production and distribution between point of consumption and end customer. The aim of the supply chain is to serve the end-customer.

For example, Christopher (1998 chapter 1) said that the supply chain is the network of different organizations that have an aim to provide services and products in the hand of end customer. That process involved many upstream and downstream linkages, in the different processes and activities. There are some internal organization activities of the firm between the downstream and upstream linkages.

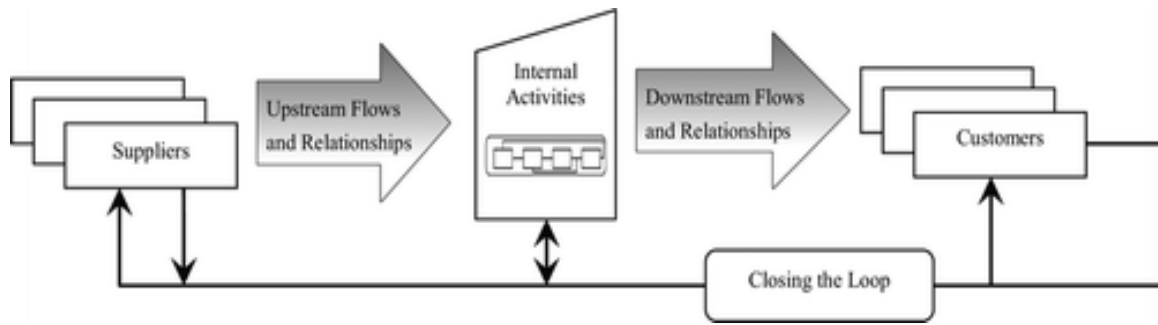


Figure 1. A supply chain network with stages and relationships (Christopher, 1998)

## 2.2 Supply chain functions, activities and flow

Supply chain process start from the supplier and end at the point of consumption or end customer. Supply chain includes different functions, activities and flow of different things.

Mainly supply chain divided into three functions

1. Upstream function
2. Internal organization function
3. Downstream function

Figure 1 shows the major function and their relationship in a supply chain. According to *Joseph (2012)* the main activities of the upstream function include purchasing and procurement functions. Other functions may also include amongst these topics: outsourcing, vendor auditing, management and selection, supplier collaboration and supplier development inbound transportation and material movement. Upstream function is totally concerned with taking the raw material towards production.

Internal organization activities include the main production and operational management. Such activities may include research and design, quality, inventory, materials, and technology management within an organization.

The downstream flow includes the various activities such as outbound transportation, marketing, distribution, packaging, and warehousing. Downstream function takes the

finished goods out from the production process or warehouse towards the hand of end customers.

The following figure 2 shows each function activities and flow. This model shows that the flow from left to right means from supplier to end customer start with the purchasing of raw material and end with the delivery of finished goods to end customer.

Products, services, information, supply and value moved from left (supplier) to right (end customer) in supply chain process. In the process, information, demand, and money or currency moved from right (end customer) to left (supplier).

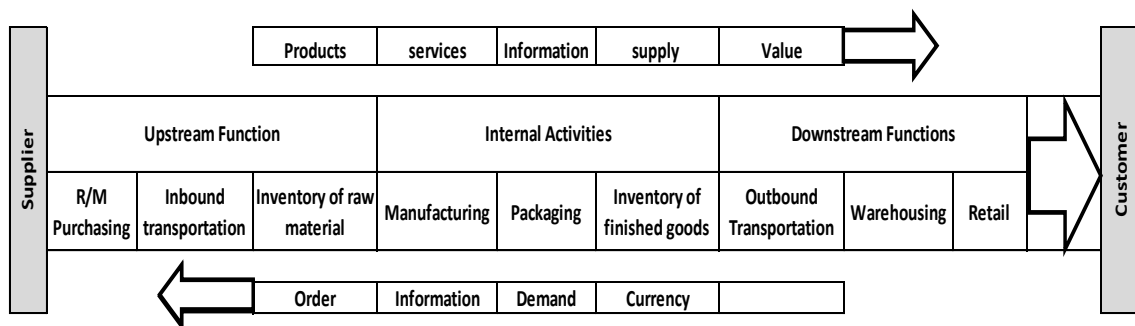


Figure 2. Flow of supply chain network

Out of all the activities of three functions, transportation is the important activity because it comes twice in the supply chain network. Once transportation is used for the supply of raw material and other equipment that is necessary for the manufacturing process. Secondly transportation system is needed for supply of finished goods to its end customer or in other words secondly transportation is needed for the movement of finished goods from the point of production to point of consumption. Most important activity in transportation is decision making regarding the selection of mode of transportation. This decision based on different factors. Every organization wants that the raw material reached on time for production to avoid any delay and finished good should reached in the hands of end customers as fast as possible. Only with the help of good transport system and infrastructure it is possible. Optimized road infrastructure or sea route play a vital role in decreasing of transit time and shipping cost.



All the activities of the supply chain network have an impact on economy of the country as well. But transportation have more impact as compare to all other activities. One example of logistics or transport impact on GDP is that according to BTRE (2001) that Australian gross value added of the transport and storage sector was \$34,496 million in 1999-2000, or 5.6% of GDP. Figure 3 shows the components of logistics costs. BTRE (2001)

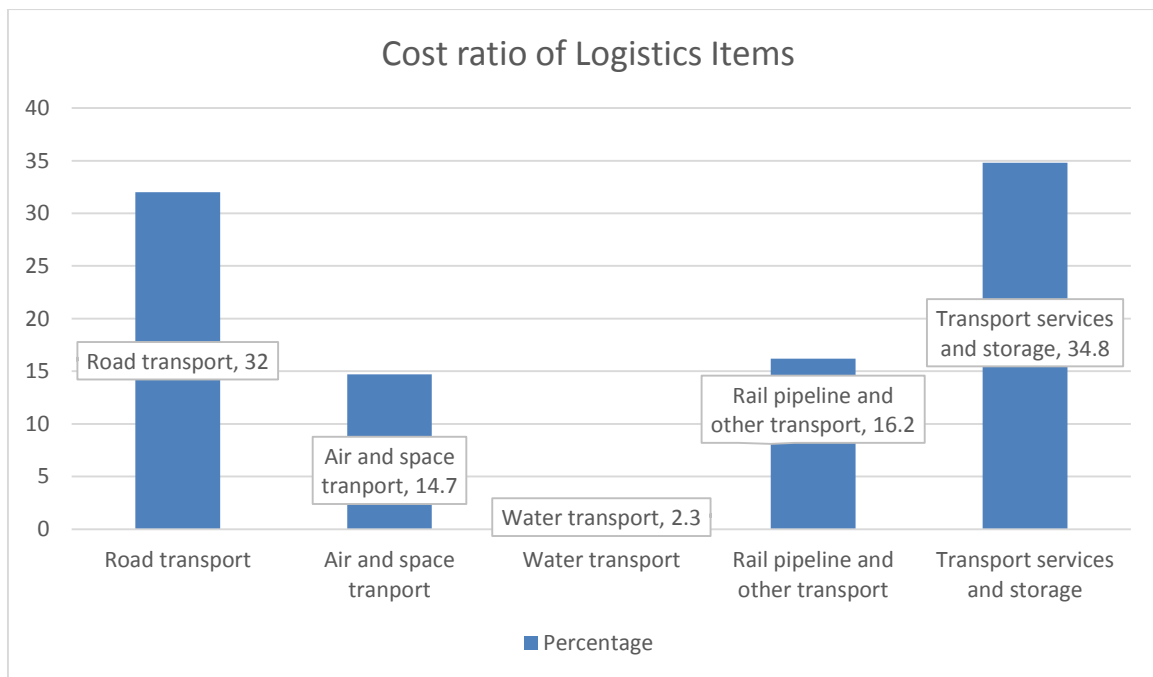


Figure 3 Cost ratio of logistics items (BTRE, 2001)

From the above mention graph numbers shows that transportation and storage services is an important economic activity of supply chain network that connected the different activities of supply chain network together.

### 2.3 Importance of shipping cost in SCM

Transport is important and big economic activity among the components of business logistics system. Cost spent on logistics is the one third or two third of the expenses of enterprises. According to the investigation of National Council of Physical Distribution Management in 1982 reported by (Chang, 1988), the total cost of transportation, on average, become a 44 % of total logistics cost and accounted for 6.5% of market revenue.

Making the route of containership and scheduling is an important part and it is very difficult to alter the route in short run. Planning and scheduling decisions are made carefully and include the issue related to cost control, profit maximization and the long-term on route availability. (Shih-Chan Ting, 2003). Managers are always busy in seeking the less expensive and reliable mode of transportation. Decision related to mode of transportation includes difficulties and complexities. Selection of carrier and mode choice needs evaluation of different factors that includes identifying relevant transportation performance variables. These factors and variables may include, negotiating rates and service levels, transit time, shipping cost and evaluation of carrier performance (Monczka et al., 2005). These are the importance decision for the organization or managers because according to Russell and Taylor, (2003) in manufacturing firm's transportation cost are very high, transportation costs average 20 percent of total production costs in manufacturing.

Companies are always busy in finding a less expensive transportation for their finished products or even for transportation of raw material. Companies save the cost of transportation, if the transportation cost of raw material is very high than it should reflect in the price of finished goods as well. Many organizations try to minimize the shipping cost due to which end product is also less expensive. Companies use less expensive transportation as competitive advantage over other firm. In this era many organizations use transportation as a strategic gear. As mention by Pedersen (1998), that one survey in conducted in Norwegian companies about transportation cost the results shows that more than 50 percent of the total logistics cost of a product is attributed to transportation. But according to Reimann, (1989) transportation and distribution of product nowadays used as competitive advantage. Performance of the transportation system, cost and transit time influence the effectiveness of the entire logistics function of a company.

Higher cost and longer transit time are important challenges for the global logistics management. The challenged includes all the activities related to international trade such as transportation, storage, custom and delivering in foreign location on time at acceptable cost. Organizations want to reduce the challenges by involving third party logistics services (Wisner et al., 2005). Decision regarding getting the third party logistics is slightly different from selection of carrier and mode but not simple. Factors or attrib-

utes that should be evaluated for the selection of third party logistics are quite similar cost, transit time, service quality, reliability, flexibility, and responsiveness. (Selviaridis & Spring 2007). Shipping cost also affected by economies of scale that related to shipment size. Full truck load is the one way for minimization of cost associated with the considerable capital expenditure for equipment. It's also called running in full capacity or utilizing full capacity. In other words, it's cheaper to ship in pallet instead of individual units. (Meixell & Norbis, (2008).

In construction industry material cost is the main ingredient of the cost nowadays in order to minimize the cost, managers and planners should not only strive to reduce the wastage and material cost but they try to cut down cost of logistics or cost of transportation that used in the movement of material especially those which are of bulky nature (Fang & Ng, 2007). Wegelius-Lehtonen, (2001) conduct an empirical study in Finland and find that the total logistic costs for the supply of plasterboard could account for 27 percent of its purchase price. In the recent era shipping cost is vary from carrier to carrier. Some are less expensive and some are more expensive with offering more services such as ensured time delivery. In organizations employ staff who just call to different shipping lines and try to get best prices for their shipments. (CabinetMaker 2001).

## **2.4 Importance of delivery/transit time in SCM**

According to Jayaram et al., (2000) transit time of logistics is a competitive advantage and strategic issue. Consistency on time delivery is a key strategic gear of organization. (Trent & Monczka, 1999; Skjoett-Larsen, 2000). Selection of transportation and carrier's mood for the movement of good inbound or outbound is an important decision. Organization try to evaluate different multiple attribute and compare before making decision. In different attribute often focusing on cost and transit time as the primary criteria. (Meixell, Norbis, 2008). According to Christopher, (2010) "The reliability of the supply chain is the most important aspect of logistics performance" Maintaining consistency in time between order and delivery time is an important competitive advantage that called lead time. The consistency of the lead-time can be viewed, to a point, as equally or indeed more important. Delivery on time shows the quality of supply chain network. Quality refers to fulfillment to requirements and on-time delivery is a fulfillment to a

delivery time requirement. (Crosby, 1979). Shipping lines try to find an optimized small route for their cargo ships that should not only reduce the transit time but also fuel efficient.

In this era markets are more competitive and saturated. Due to this reason, companies attract customers by offering new services in addition of core products and services. (Tuli et al., 2007). Many companies try make their product or service convenience to build strong relationship with the customer. (Seiders et al., 2007); some companies loose the customers because of inconvenience or discontinue the relationship. (Keaveney, 1995). Time based services in supply chain is a convenience for the end customer and companies use it as competitive advantage.

Delivery on time to customer is the responsibility of the logistics provider. By offering consistent on time delivery logistics service providers attempt to manage the physical interface between the retailer and consumer more effectively that should enhance the convenience perceived by the consumer and, as a consequence, to increase the attractiveness of the retailer's product and the logistics service provider's service offering. (Philipp et al, 2012)

Companies, manufacturers and production houses that cannot deliver the goods on time would not keep their customers happy or keep them at all. Everyone wants their product in the hand of a customer as soon as possible without delay (Fred N. Horning, et al 2003). Once a product is manufactured and shifted into the company's warehouse it becomes the burden of the company. Because of huge capital stuck in the finished goods. Manufacturer wants to get the payment back by delivering goods to its final customer or consumer as quickly as possible.

The key element in a logistics chain is the transportation system, which joints the separated activities. Nowadays businesses are more competitive. Organizations more and more realize the effective role of supply chain networks that enable the organization to compete in the global market and competitive and networked economy. Route of transportation system must be updated accordingly so that decisions are based on dynamic information. In supply chain network transportation system used twice once as inbound

logistics with the help of which raw material and other things come in for manufacturing process and the secondly outbound transportation with the help of which finished goods reached to serve end customers. Since transportation used twice in supply chain network so it's necessary to give more attention for getting good and efficient transport system that not only save the time but also the cost as well.

CPEC route includes sea route and road (highways) so there are many challenges as well. Road (highways) traffic systems involve perhaps the most complex set of interactions related to transportation. Individuals in such systems need to be in constant control of their vehicles. They also make continuous decisions relating to route and lane choice, speed, acceleration and deceleration, overtaking, merging and response to information and control messages (Ramachandran, 2006). Nowadays there is great differences in transit time and shipping cost, that not only put impact on decision regarding selection of mode of transport but also on shippers' carrier selection decisions and their development of effective international ocean transportation strategies. (Saldanha, Russell, & Tyworth, 2006). One survey study about the Singaporean shippers' satisfaction by Durvasula, Lysonski, & Mehta's (2000) found that most of shippers marked transit time reliability as the most important problem with carrier's services.

### 3 PAKISTAN

This chapter includes detailed information about Pakistan’s geography, climate, economy and government. CPEC passes through Pakistan so it is very important to understand the geography and climate of Pakistan. Climate has a direct impact on CPEC. If there is heavy snow or flood, then it will affect the proposed trading route.

#### 3.1 Geography of Pakistan



Figure 4: Map of Pakistan (Theyourweb, 2015)

Pakistan is located in southern Asia. It has borders with Afghanistan, Iran, India, China and Arabian Sea. Iran and Afghanistan on the west, India on the east, China in the north and Arabian Sea on the south side. Pakistan enjoys a unique geographical landscape situated at the cross-roads in Asia. Pakistan’s landscapes vary from deserts, high mountains, forests and green belts. Pakistan’s terrain consists on flat Indus plain in east; mountains in the north and northwest; Baluchistan plateau in the west. In elevation lowest point is Indian Ocean 0 m and highest point is K2 (Mt. Godwin-Austen) 8,611 m. In

the north Pakistan has some of the world's highest peaks like K2 (28,250 ft. 8,611 m) and Nanga Parbat (26,660 ft. 8,126 m). In the south lies the Arabian Sea. (CIA World fact book, 2016) The land of Pakistan has natural diversity. High Mountains in the north of Pakistan while on the other side is Arabian Sea, desserts and green belts as well. Pakistan has a range of mountains. (Kazi s Ahmed, 1951)

- K-2 second highest peak of the world
- The Himalaya range
- The Karakorum Range
- The Hindukush
- The sulaiman range

Pakistan has four provinces.

1. Sindh
2. Punjab
3. Baluchistan
4. Khyber-Pakhtunkhwa (Previously NWFP)

Some geographical facts about Pakistan are given in the following table. Data is collected from CIA's website but the table is prepared by the author.

*Table 1: Geographical facts about Pakistan (CIA world fact book, 2016)*

<b>Particular</b>	<b>Area</b>
Total area	803,940 sq. km
Land	778,720 sq. km
Water	25,220 sq. km
Population	199,085,847 (July 2015 est.)

Table 2: Pakistan border line length (CIA world fact book, 2016)

Neighboring countries	Border length
Afghanistan	2,670 km
Iran	959 km
India	3,190 km
China	438 km
Coastal areas	1,046 km (Coast line)

### 3.2 Climate

Information about climate is very important especially about those areas from where the corridor is passing. Climate of Pakistan is mostly hot, dry desert; high temperate in northwest; but very cold in the north. Pakistan has 4 seasons in its full swing. During winters, Pakistan experiences temperature between -10 to -20 in northern areas and in south it ranges from +10 to +20. (CIA World fact book, 2016). Pakistan has a natural diversity in weather. However, sometimes it faces extreme weather conditions.

The highest rainfall of 620 millimeters (24 In) was recorded in the capital of Pakistan on 24 July 2001. It was the heaviest rainfall in the history of Islamabad. The other extremes of the weather were seen on 26 May, 2010 in a place Mohenjo-daro in the province of Sindh. That extreme was the highest temperature ever recorded in Pakistan, 53.5 °C (128.3 °F). (Pak met, 2010)

It was not only the hottest temperature ever recorded in Pakistan but also the hottest reliably measured temperature ever recorded on the continent of Asia. According to the World Bank's data, the average rainfall and temperature of Pakistan between the periods of 1990 to 2012 is shown in the following figure.



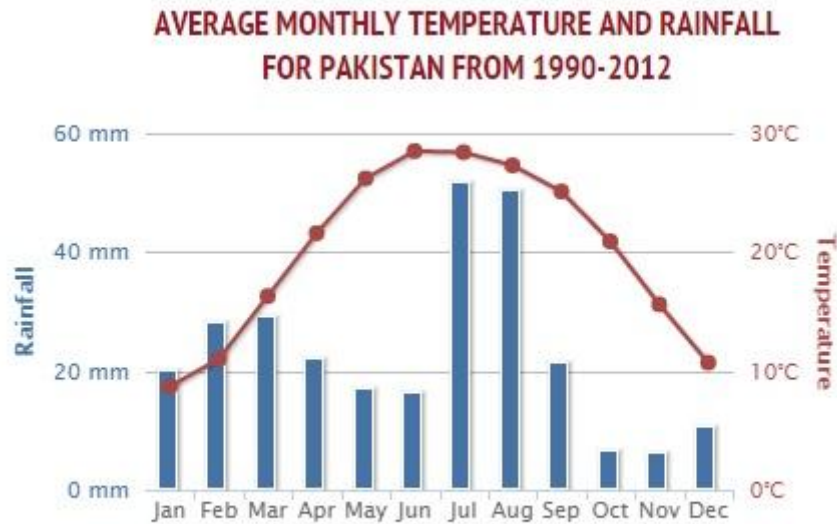


Figure 5: Average temperature and rainfall of Pakistan (World Bank, 2013)

In the northern parts of Pakistan, heavy snow fall and land sliding may put a negative impact on CPEC. Usually, Shahrah e karakoram, which is currently used for trade from China, is blocked during winters and rainy season due to heavy snowfall, rain and land sliding. Following picture shows the blockage of shahrah e karakoram due to land sliding in the month of April 2016. (Jang, 2016)



Figure 6: Land sliding Blocked shahrah e karakoram (Jang April, 2016)

Pakistan has four seasons that can be distinguished as follows.

Table 3: Average Temperature in different seasons (World Bank, 2016)

Seasons	Average Temperature
Winter (Mid December to March)	20 to -25 Degree
Spring (March to April)	25 to 35 Degree
Summer (May to august)	32 to 53 Degree
Autumn (September to November)	18 to 5 Degree

### 3.3 Economy of Pakistan

Pakistan came into being in 1947. At that time Pakistan had 30 million people with per capita income of 100\$. Agricultural sector accounted for at most 50 % of the economy with no manufacturing. (Dr Hafiz A Pasha, 2014). Nowadays the economy of Pakistan is the 26<sup>th</sup> largest in the world in terms of Purchasing power parity (PPP). According to IMF the Current GDP of Pakistan for the FY15 is 271 Billion. The GDP value of Pakistan represents 0.39 percent of the world economy. Per capita GDP is 1427USD. (Trading Economies, 2016). According to World Bank report the GDP growth rate of Pakistan is 4.7 % in 2014. Following chart shows the GDP rate between the years 2006 to 2014. (Trading Economies, 2016)

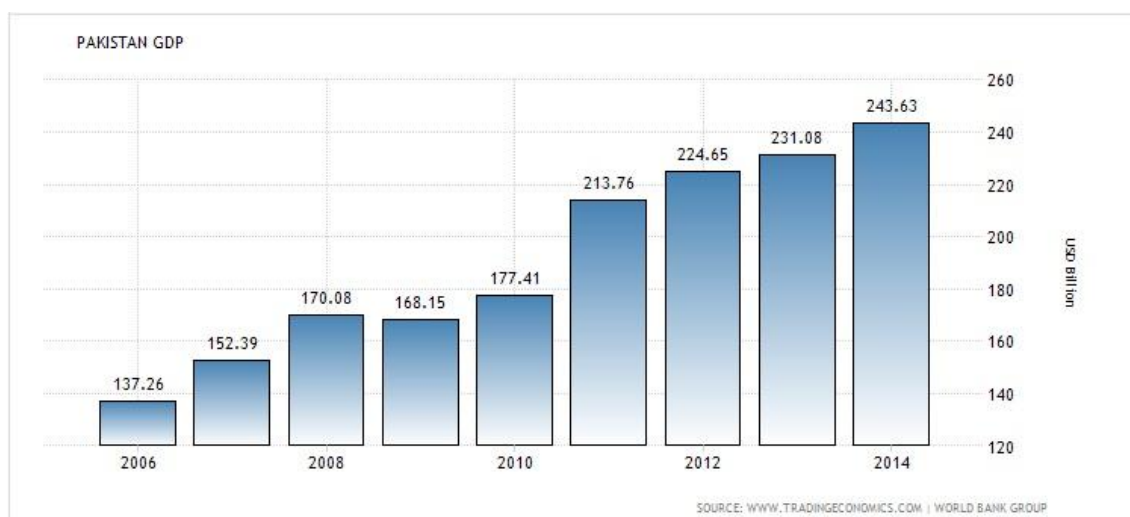


Figure 7: GDP of Pakistan (Trading economies, 2016)

The total population of Pakistan is about 190 million (2015) (the 6<sup>th</sup> Largest in the world). (Wikipedia, 2016). Pakistan is rich in natural resources such as marble, extensive natural gas reserves, petroleum, coal, iron ore, copper, salt and limestone. (CIA World fact book, 2016). Pakistan is an agricultural country which has main crops including wheat, sugarcane, cotton, and rice. Total agricultural land is 35.2% and arable land is 27.6%. (CIA World fact book, 2016)

Pakistan is a developing country. It has a potential to become one of the world's largest economy in the 21<sup>st</sup> century. (Tavian Grant, 2011). Major exports of Pakistan include textile, leather good, sports, chemicals and carpets. The biggest city of Pakistan is Karachi, which is the main economic hub of Pakistan.

According to CIA fact book total export of Pakistan in 2013-14 is \$29.873 Billion dollar in which goods \$24.131 billion and services \$5.741 billion. Following are the major export partners of Pakistan.

*Table 4: Main exporting Partners (CIA World fact book, 2016)*

<b>Country</b>	<b>Percentage of total exports</b>
US	13.3%
China	10.9%
UAE	8.6%
Afghanistan	8.5%
Germany	5.1%

According to world fact book, in 2013-14 total import of Pakistan is \$41.668 billion. Major import partners include countries listed in the table. (CIA World fact book, 2016)

*Table 5: Main Importing Partners (CIA World fact book, 2016)*

<b>Country</b>	<b>Percentage of total imports</b>
China	17%
UAE	15%
Saudi Arabia	8.5%
Malaysia	4.8%

### **3.4 Government**

Pakistan (the official name is Islamic republic of Pakistan) is governed under the constitution of 1973, which provides a parliamentary form of government. The president is called head of state and selected for a five-year period by an electoral collage of parliamentarian of national and provincial assemblies.

The government is led by the Prime Minister. The Prime Minister is selected by a national assembly. The national assembly of Pakistan has 342 members in which 60 seats are reserved for women and 10 for non-Muslims. All members serve for five years. (GOP portal, 2016)

Each province has its own assembly called provincial assembly and parliamentarian for provincial assembly elected by popular vote. The 100 members of the Senate are indirectly elected by provincial assemblies and the territories' representatives in the National Assembly.

The capital of Pakistan is Islamabad. The current president of Pakistan is Mamnoon Hussain and prime minister is Nawaz Sharif. The main problems faced by Pakistan are: unstable government, terrorism, foreign debt, weak currency, circular debt and spending priorities. (Wikipedia, 2016)

## **4 CHINA PAKISTAN ECONOMIC CORRIDOR**

### **4.1 What is CPEC?**

The China Pakistan economic corridor (CPEC) is being developed as part of strategic partnership between the government of Pakistan and China. CPEC was announced during the visit of Pakistani premier to China in July 2013. China Pakistan economic (CPEC) corridor is a long term plan having a time frame of 2014 – 2030. There are five main components of CPEC.

1. Gwadar (including port, city and Gwadar region socio-economic development)

2. Energy (Coal, Hydel, Wind, Solar, LNG, Transmission)
3. Transport Infrastructure (Road, Rail, Aviation)
4. Investment & Industrial Cooperation (Gwadar Free Zone and other industrial parks to be finalized)
5. Any other area of interest mutually agreed

CPEC is not only a network of road, highways, rail network but it's a package of different projects that fulfill the energy and other requirement of Pakistan. Total Investment of China is about \$ 46 billion. The breakup of CPEC projects portfolio investment is given in following table.

*Table 6: CPEC portfolio of investment (BOI Pakistan, 2015)*

<b>PROJECTS</b>	<b>US\$ MILLIONS</b>
Energy	33,793
<b>Transport and Infrastructure</b>	
Roads	6,100
Rail network	3,690
Mass transit in Lahore	1,600
Gwadar Port	786
Others	44
<b>TOTAL</b>	<b>46,013</b>

## **4.2 CPEC Projects**

In this section of thesis details of each project is given with the cost.

### **4.2.1 CPEC Energy Projects**

One of the basic requirements for the economy of Pakistan is energy. Pakistan is facing shortage of electricity since last decade. Due to the load shedding, businesses suffer badly. Due to the high demand of electricity, the energy projects play a vital importance in CPEC projects. Following projects should be completed under CPEC investment plan.

Table 7: CPEC energy Projects (BOI Pakistan, 2015)

S.NO	PROJECT	MW	(US\$M )
1	Port Qasim Electric Company Coal Fired, 2X660, Sindh	1320	1,980
2	Sahiwal 2x660MW Coal-fired Power Plant, Punjab	1320	1,600
3	Engro thar 2x330MW Coal-fired, Thar, Sindh Surface mine in Block II of Thar Coal field,3.8 mtpa.	660	1,000 860
4	Gwadar Coal Power Project, Gwadar	300	360
5	Muzaffargarh Coal Power Project, Punjab	1320	1,600
6	Rahimyar Khan Coal Power Project, Punjab	1320	1,600
7	SSRL Thar Coal Block 6.5mtpa &CPIH Mine Mouth	1320	1,300
8	Quaid-e-Azam Solar Park, Bahawalpur, Punjab	1000	1,350
9	Dawood 50MW wind Farm, Bhambore, Sindh	50	125
10	UEP 100MW wind Farm, Jhimpir, Sindh	100	250
11	Sachal 50MW Wind Farm, Jhimpir, Sindh	50	134
12	Sunnec 50MW wind Farm, Jhimpir, Sindh	50	125
13	Suki Kinari Hydropower Station, KPK	870	1,802
14	Karot Hydropower Station, AJK & Punjab	720	1,420
	<b>Total (Priority)</b>	<b>10,400</b>	<b>15,506</b>
	<b>CPEC Energy (actively promoted projects)</b>		
15	Gaddani Power Park Project		
A	4×660MW	2640	7,920
B	Jetty + Infrastructure		1,200
C	Transmission Line to Lahore and Faisalabad		3,000
16	HUBCO coal power plant, Hub Baluchistan	660	970
17	Chichoki Mallian Combined-cycle Power Plant, Punjab	525	550
18	Salt Range Mine Mouth Power Project, mining, Punjab	300	800
19	Kohala Hydel Project, AJK	1100	2,397
20	Pakistan Wind Farm II (Jhampir, Thatta, Sindh)	100	150
21	Thar mine mouth oracle, Thar Sindh	1320	1,300
	<b>TOTAL (Actively promoted projects)</b>	<b>6645</b>	<b>18,287</b>
	<b>TOTAL ENERGY PROJECTS</b>	<b>17045</b>	<b>33,793</b>

#### 4.2.2 CPEC Transport infrastructure sector projects

This section describes the transport infrastructure sector projects. These projects have a capability to reduce the shipping costs and transit time of Chinese imports and exports.

Table 8: CPEC Transport infrastructure sector projects (BOI Pakistan, 2015)

S.NO	PROJECTS	KM	US\$M
1	KKH Phase II (Raikot – Islamabad Section)	440	3,500
2	Peshawar-Karachi Motorway (Multan-Sukkur Section)	392	2,600
3	<b>Rail Sector Projects</b>		
4	Expansion and reconstruction of existing Line ML-1	1736	3,650
5	Havelian Dry port (450 M. Twenty-Foot Equivalent Units)		40
	<b>TOTAL</b>		<b>9,790</b>

#### 4.2.3 CPEC Gwadar port related projects

In given table, all the Gwadar development related projects are listed. Before completion of CPEC, Gwadar needs adequate infrastructure to fulfil future demands which will generate from the project. Mentioned below are projects for the Gwadar city.

Table 9: CPEC Gwadar port related projects (BOI Pakistan, 2015)

S.NO	PROJECTS	US\$ M
1	Eastbay Expressway	<b>140</b>
2	Gwadar International Airport	230
3	Construction of Breakwaters	130
4	Dredging of berthing areas & channels	27
5	Infrastructure for Free Zone & EPZs port related industries	35
6	Facilities of Fresh Water Treatment and Supply	114
7	Hospital at Gwadar	100
8	Technical and Vocational Institute at Gwadar	10
	<b>TOTAL GWADAR PORTS PROJECTS</b>	<b>786</b>

#### 4.2.4 CPEC Others projects

As mentioned earlier, the CPEC package is not only one corridor, it includes several other projects as well. Mass transit Lahore and optical fiber are also parts of CPEC.

Table 10: CPEC others Projects (BOI Pakistan, 2015)

S.NO	PROJECTS	US\$ MILLIONS
1	Mass transit Lahore	1,600
2	Cross Border Optical Fiber Cable	44
	<b>TOTAL</b>	<b>1,644</b>

#### 4.3 Description of CPEC Route

CPEC is a game changer in Asia. It includes road and infrastructure projects that are about 3,000-km network of highways, railways and pipelines linking Kashgar Dry port in northwest China's Xinjiang and southwest Pakistan's Gwadar Port and provide shortest link to Indian and Arabian Ocean. The distance between Kashgar dry port (China) and Shanghai sea port (China) is about 5,153 km which is currently used by China for moving its goods from Kashgar to Shanghai port. On the other hand, distance from Kashgar dry Port (China) to Gwadar seaport (Pakistan) is about 2,800 Km, which is almost half of the current route.

CPEC is the one part of silk route belt that was proposed by Chinese President Xi Jinping in 2013, aimed at reviving the ancient trade routes that span Asia, Africa and Europe. (BY Inp, 2015). Pakistan's Minister of Planning Ahsan Iqbal said that CPEC is not merely a project between two countries, but it is more than that. The project will be beneficial for other countries as well apart from Pakistan and China. Pakistan has decades of mismanagement, bad governance and a low socio-economic infrastructure, but Pakistan does enjoy a strategic location. (Muhammad Daim fazil, 2015).

Pakistan has a transit of economy. Pakistan has a border with land locked country Afghanistan so Afghanistan will be doing its trade through Pakistan to other countries. China is world fastest growing economy which enjoys 9% GDP rate. (Atlas media



OEC). China is developing CPEC because its own seaport is 5,153 Km away from western China, however, seaport of Gwadar is only about 2800 Km away.

Pakistan’s geological position is also the gateway for central Asia and offers central Asian state (Afghanistan, Kyrgyzstan, Kazakhstan, Tajikistan, Turkmenistan, and Uzbekistan) a shortest route of 2600 km as compare to Iran 4500 km and Turkey 5000 km.

China Pakistan Economic Corridor is the network of roads, highways and railways that connect the Kashgar dry Port of China with Gwadar sea port of Pakistan.

Total length of the route from Gwadar to Khunjerab is 2688 Km. The length includes the area of mountain, rolling and flat. For the CPEC, 2 to 6 lanes have been proposed and each lane is 3.65 meter wide. Design speed for the CPEC route is about from 70 kph to 120 kph. The proposed road map of CPEC and different phases of highways shown in the following map. Basically this corridor consists of three routes.

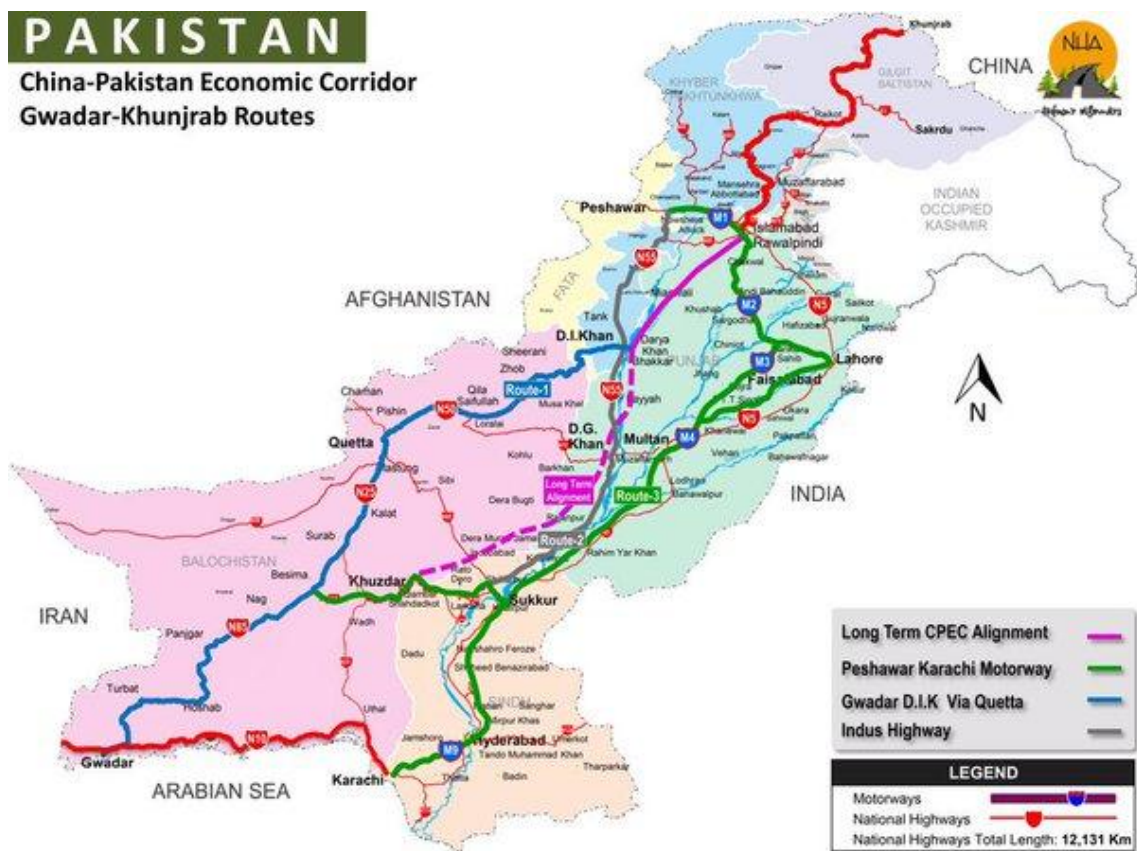


Figure 8: CPEC proposed three route Gwadar to khunjerab (NHA, Pakistan, 2016)

Three routes of the economic corridor include,

1. Western Route
  2. Central Route
  3. Eastern route
- The western route starts from Gwadar and will pass through different cities of Baluchistan includes, Turbat, Panjgur, Nag, Basima, Sorab, Qalat, Quetta, Qilla Saifullah and Zhob and reach Dera Ismail Khan before leading to Islamabad. A couple of sections of the road between Gwadar and Quetta are currently at an advanced stage of construction.
  - The central route will also originate from Gwadar and also reach Dera Ismail Khan via different cities of Baluchistan, Sindh and Punjab Province. Cities includes, Basima, Khuzdar, Sukkur, Rajanpur, Layyah, Muzaffargarh and Bhakkar.
  - The third route will include Gwadar, Basima, Khuzdar, Sukkur, Rahimyar Khan, Bahawalpur, Multan and Lahore/Faisalabad and then reach Islamabad.

CPEC is not only focused on highways or road ways but also there is a plan to link Gwadar and Kashgar via rail network. Rail network plays a role of backbone for the economy of country. In the following map, the black and white line shows the existing network of railways in Pakistan. Red and white line shows the expansion of the current network to increase the capacity. Green and white line shows the proposed future construction of railway line from Havelian (Pakistan) to Kashi (China) which is 1059 Km long.

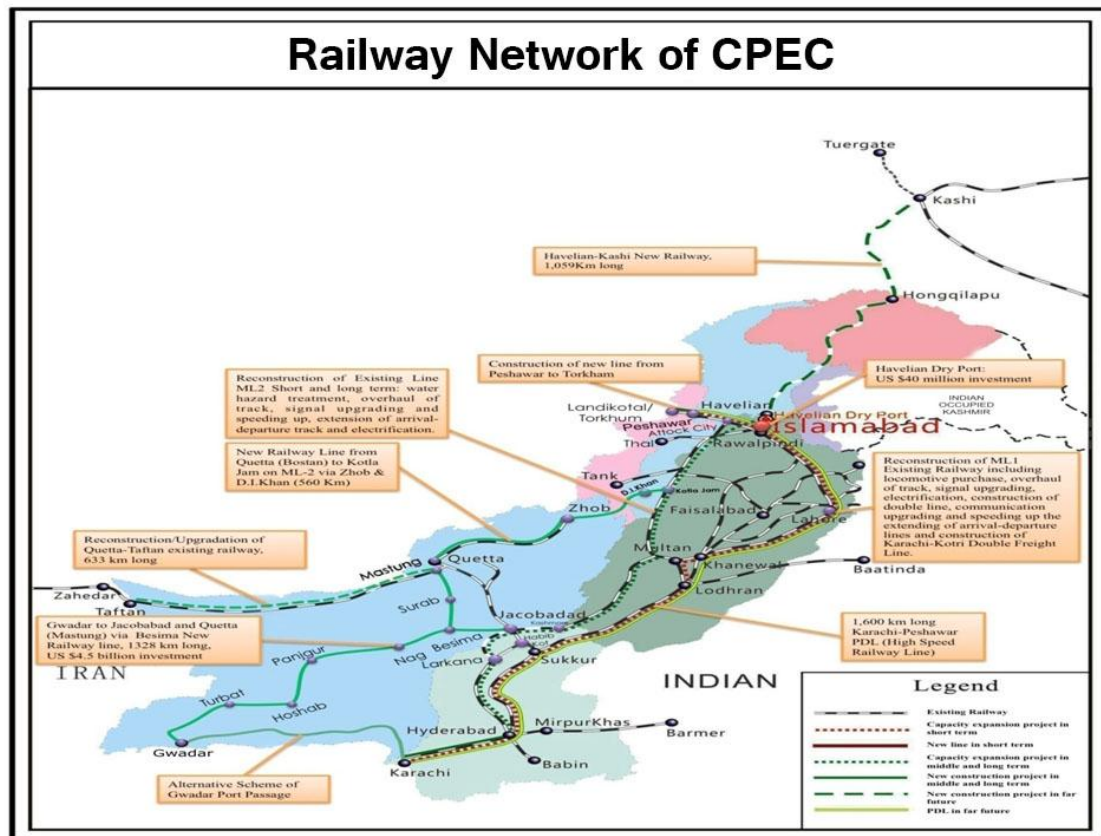


Figure 9: CPEC proposed railway line from Karachi, Gwadar to Khunjerab (NHA Pakistan, 2016)

#### 4.4 Impact of CPEC in general

Chinese president during his visit to Pakistan in April 2015 signed MOU and agreement of projects which having a worth of USD 46 Billion. This investment plan is a part of the Chinese master plan called “One belt, One Road”. One belt one road is the plan network of road, rail, oil and gas pipeline that connects China to south and central Asia. Most of the projects are likely to be completed within the next three years.

This CPEC investment has a significant direct and indirect impact on the economy of Pakistan. Direct impact of investment can lift the FY16-18 GDP growth beyond 6 %. (BMA Capital). Indirect impact is long term impact for the economy of Pakistan and much higher than the direct impact. As mentioned earlier, bulk of the investment in energy sector because Pakistan is facing energy shortfall since last decade. The energy projects will produce more than 15000MW of electricity that has the potential to give a boost to current industry of Pakistan and attract the private investors.

Private sector investment to GDP is low during last five years 9.6% as compared to preceding Five year 12.7%.

The investment also has an impact on the stock market. The revenue and share prices will increase for the cement and steel sectors due to heavy construction. Productivity of manufacturers should also increase due to high demand and availability of energy. Consumer stock also gets benefits from the higher level of demand and income levels.

China is also equally beneficiary of the current investment. Bulk of the investment goes into energy related projects but main theme of the project revolves around Pakistan-China Economic corridor that connects China Kashgar in Xinjiang Province to Gwadar port Pakistan. The CPEC trade route of China-Pakistan economic corridor will reduce the distance between (Kashgar in Xinjiang Province) China, 5,153km away from Beijing) and the Persian Gulf to 2,500 km as opposed to the existing distance of 13,000 km from Beijing to the Persian Gulf and reduce shipping time from 45 days to 10 days.

This new route will help China to get its important imports like oil only in 10 days with less freight. CPEC significantly shortens China's current trade route to Middle East, Africa and Europe. Another bird eye view of current and new proposed trade route of China. Red line shows the new CPEC route.

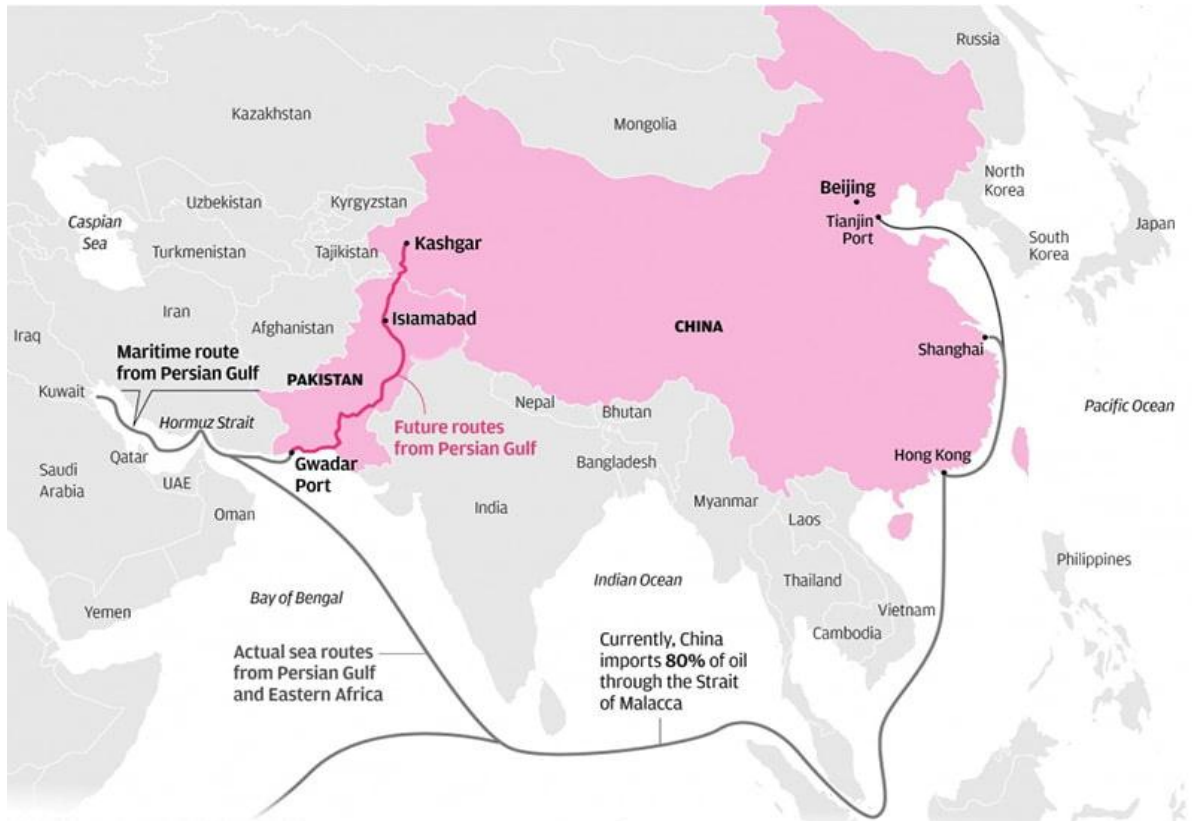


Figure 10: Bird eye view of CPEC and current route (BMA capital, 2015)

## 5 METHODOLOGY

In this study, the main focus is on the shipping cost and transit time. Organization managers focus on different attributes of mode of transportation before decision making on selection. The most important attributes are shipping costs and transit time.

CPEC is a project that has a greater impact in shipping costs and transit time attributes of trade. This study tries to find the change in transit time and shipping cost of one 40-foot container for imports and exports from Middle Eastern and European region to Kashgar (western China).

The methodology is based on three parts, first part is related with the calculation of current transit time and shipping costs, i.e. how much time and shipping cost should take by one 40-foot container to reach the destination ports. Second part deals with the calculation of new proposed route transit time and shipping costs. The third part consists of a comparison of both route's shipping costs and transit time. The Third part enables this study to compare the shipping cost and transit time of 40-foot container and make recommendation which route is cost efficient.

### 5.1 First Part

In the first part, this thesis selects the 3 ports that have more imports and exports with China from European countries and 3 ports from Middle Eastern countries on which China is relying for fulfilling the energy requirement. After selecting the ports this study calculates the current transit time and shipping cost of one 40-foot container from these selected ports to Kashgar Western China. The route from the selected ports to Kashgar (western China) consists of seaway and roadway. For creating better understanding current route divided in two parts, Distance between Kashgar (western China) to Shanghai seaport named CR (China road) and sea distance from Shanghai to destination ports are named CS (China Sea). Following map shows the current route which is using by China for its imports and exports.





By adding shipping cost and transit time of CR (China road) and CS (China Sea) this study finds the current route shipping cost and transit time of 40-foot container that imported or exported to China from selected destination ports.

## 5.2 Second Part

In the second part, this study calculates the transit time and shipping cost of proposed route CPEC. This route is also based on seaway and roadways. Road distance between Kashgar and Gwadar named as PR (Pakistan road) is shown below in the map. Sea distance from Gwadar port to destination port named PS (Pakistan Sea). Following map shows the CPEC route.



Figure 12: New proposed CPEC route

If China exports something from proposed route in future after completion, then in this route shipment from Kashgar (western China) first reaches to Gwadar by PR (Pakistan road) as shown on map. Then, from Gwadar or Karachi port shipment should be loaded on the ship and sends for final selected destination by PS (Pakistan Sea) as shown on



map. If China wants to import something from selected destination than above mention process goes other way round. Cost and transit time of PR and PS calculated in the same manner that is described in the first part of methodology. By adding cost and transit time of PR and PS this projects gets total transit time and shipping cost of one 40-foot container which is transported through proposed CPEC route.

### **5.3 Third Part**

In the third part, this thesis compared the shipping cost and transit time of current route with the proposed CPEC route. The data calculated in the first and second part is used for comparison.

## **6 TRADING VOLUME WITH SELECTED DESTINATION COUNTRIES**

Before calculation of transit time and shipping costs for the selected destination, it is very important to know that how much China exports to and imports from these countries. With the help of trading volume this thesis is able to establish the impact of CPEC route on exports and imports of China in terms of shipping cost and transit time.

### **6.1 China exports volume to Destination countries**

China stands at top in export field in the world. According to atlas media OEC total volume of China exports in 2013 is \$2.25trillion. Following table shows the exports volume to selected destination countries.

Table 11: Export volume to selected destination countries (Atlas media OEC, 2013)

Destination Countries	% of China total Export	Export in Billion
Germany	4.1%	\$92.5
France	2.2%	\$50.4
Netherland	2.0%	\$44.7
Saudi Arabia	0.88%	\$19.8
Kuwait	0.17%	\$3.85
Oman	0.12%	\$1.21
<b>Total</b>	<b>9.47%</b>	<b>\$212.46</b>

Below mentioned graph shows the China exports to destination countries. Germany with \$92.5 billion and France with the volume of \$50.4 billion are big importers of Chinese goods and Oman is the country, which imports less goods from China.

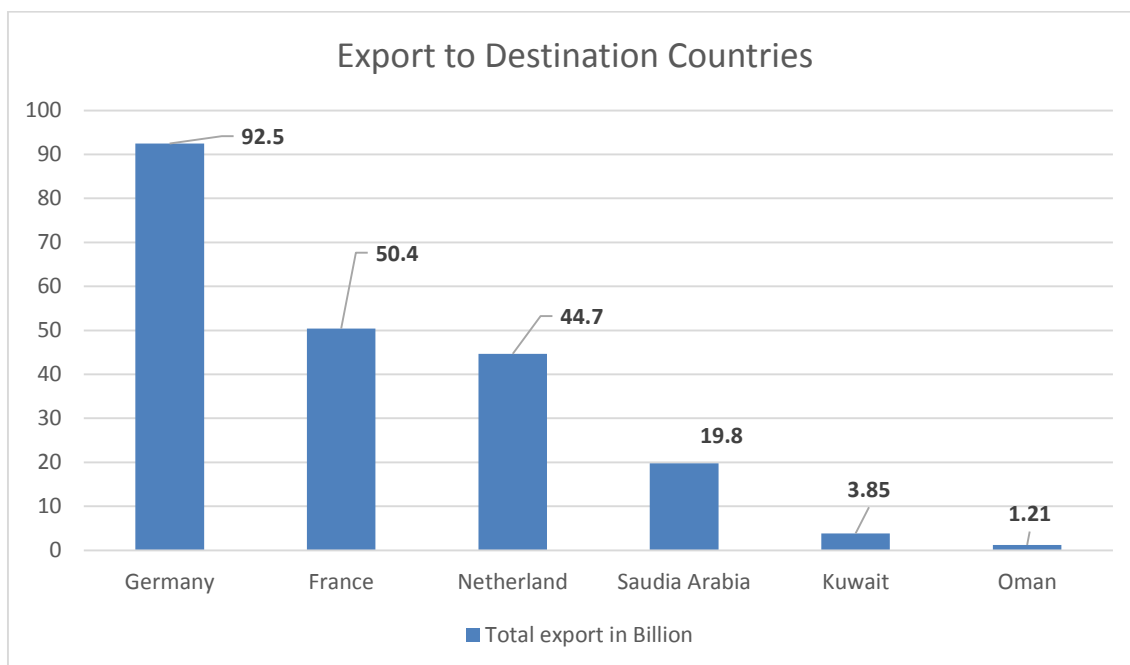


Figure 13: Export to Destination countries (Atlas media OEC, 2013)

## 6.2 China imports volume from Destination countries

China stand 2<sup>nd</sup> in imports. Total volume of China imports in 2013 is \$1.56 trillion dollars. Following table shows the imports volume from selected destination. Germany and Saudi Arabia are the big import partner of China. China mainly import machinery and other stuff from Germany and Oil products from Saudi Arabia.

Table 12: Import volume from selected destination countries (Atlas media OEC, 2013)

Destination countries	% of China total Imports	Imports in Billion
Germany	5.6%	\$87.4
France	1.3%	\$20
Netherland	0.66%	\$10.3
Saudi Arabia	3.1%	\$48
Kuwait	0.57%	\$8.93
Oman	1.2%	\$18.9
<b>Total</b>	<b>12.43%</b>	<b>\$193.53</b>

Graph shows that China imports from Germany is about \$87.4 billion, \$20 billion from France, \$10.3 billion from Netherlands, \$48 billion from Saudi Arabia, \$8.93 billion from Kuwait, and \$18.9 billion from Oman.

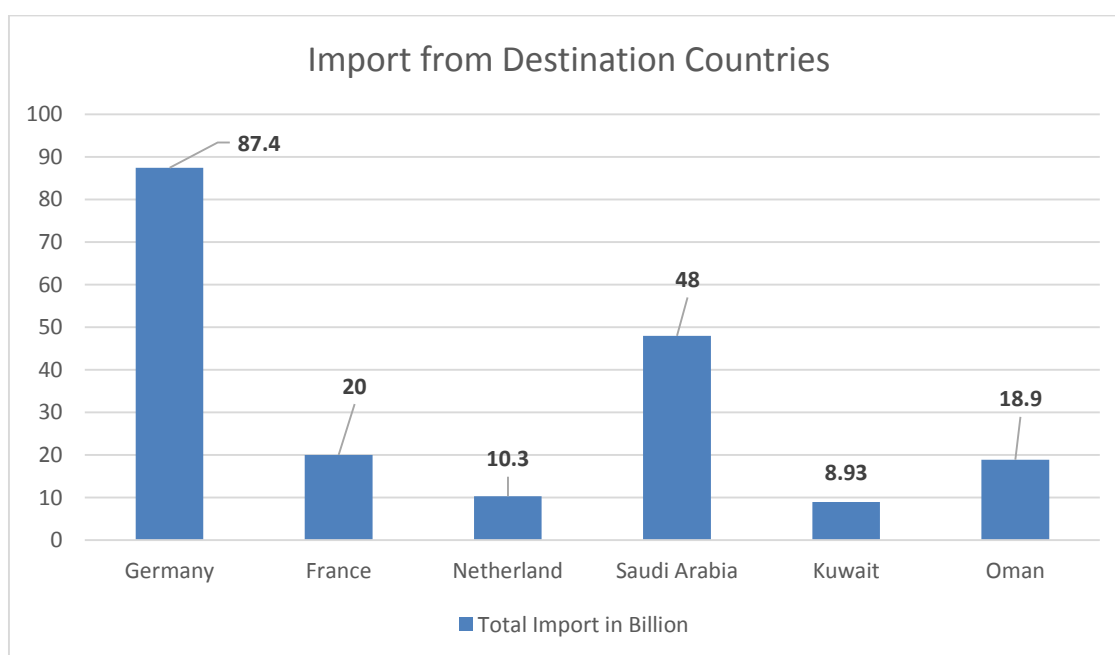


Figure 14: Import from destination countries (Atlas media OEC, 2013)

## **7 SHIPPING COST AND TRANSIT TIME CALCULATION**

This chapter includes the calculation of shipping costs and transit time of one 40-foot container which is transported from dry port of origin Kashgar (western China) to destination ports. In the first section of this chapter, shipping costs and transit time of 40-foot container is calculated if its transported through current route as mentioned in the methodology part one.

In the second section of this chapter, shipping costs and transit time of 40-foot container is calculated if it's transported through proposed route as mentioned in the methodology part two.

### **7.1 Current route shipping cost and transit time Calculation**

In this computation, thesis calculates the current route shipping cost and transit time of 40-foot container that is transported from dry port of origin Kashgar (western China) to selected ports of destination. Current route is based on road and sea ways called CR and CS as shown in figure 11.

In the first step, the shipment comes through CR (china road) from Kashgar (Western china) to the seaport of Shanghai (China). In the second step, it will go from Shanghai seaport to selected destination ports by CS (China Sea). So this project calculates the current route shipping cost and delivery time of 40-foot container from the port of origin to destination simply by adding CR and CS. Sea freight and transit times are available and gathered from different shipping companies. But road transport costs and transit time are calculated. In first step this thesis calculates CR part road cost and transit time.

#### **CR (China Road) Road cost**

For calculation of CR part inland haulage charges, the distance of CR part is multiplied by the average per kilometer truck or rail cost. Total distance of CR part is about 5,153 KM according to google maps. The average per kilometer cost is \$0.40 per kilometer that is retrieved from AW logistics (AW logistics, 2016). Inland haulage cost of differ-

ent local transporter varies so average cost is utilized to fulfill the requirement. In below mentioned computation CR part inland haulage charges is calculated by multiplying CR distance and average per kilometer cost.

*Table 13: Cost of road transport of CR part*

<b>CR ( China Road ) Inland haulage Charges</b>			
CR Inland haulage charges	CR Distance in kilometers	*	Per kilometers cost
CR Inland haulage charges	5,153	*	\$0.40
CR Inland haulage charges	\$2061.2		

The calculation shows that the inland haulage charges (road transportation costs) of CR part is about \$2100. Its means one 40-foot container will reach in \$2100 from dry port of Kashgar to sea port of Shanghai.

### **CR (China Road) Transit time**

CR transit time is calculated by dividing total distance of CR part by average truck or rail speed in that region. Distance of CR part is retrieved from google maps and average truck or rail speed got from local transporter such as AW logistics (AW logistics, 2016). In some part the speed of truck is high up to 80 kph but at mountain area it's dropped to 30 kph or below. Due to that reason average 40 kph value is taken to fulfill the requirements.

*Table 14: CR part Transit time*

<b>CR (China Road) Transit time</b>			
CR transit time	Distance in kilometers	/	Average truck or rail speed
CR transit time	5,153	/	40KPH
CR transit time	128 hours		

CR part transit time is about 128 hours means one 40-foot container took 128 hours to reach Shanghai from Kashgar. But other factors should also be considered. Other factors that might increase the road transit time may include,

- Weather condition,
- Traffic Jam
- Strikes
- Law and order situation
- Rest of drivers after long drive

For getting more accurate results average 24 hours of delays in transit time put in each journey at CR part due to above mention factors. In below computation average 24 hours' delay is added in CR transit time. These 24 hours are based on assumption.

*Table 15: Total CR part transit time*

<b>CR (China Road) Transit time</b>			
CR transit time	Current road transit time	+	Average delays
CR transit time	128 hours	+	24 hours
CR transit time	152 hours or / 6.3 days		

Results shows that one 40-foot container took 152 hours or 6.3 days to reach Shanghai from Kashgar.

After calculation of road costs and transit time of CR part, it will be added in CS part that directly retrieved from Freight forwarder and shipping lines. This thesis finds the total current route shipping cost and transit time.

### **7.1.1 Current route Shipping cost**

In all cases origin port is Kashgar (western China). Shipment first reaches by CR to Shanghai port, then it will move for destination port by CS. For calculation of current shipping cost this thesis should add the shipping cost of CR part and CS part. CR road cost is calculated in table # 13. Sea freight for Europe is taken by CMA and MSC Lines and sea freight for Middle East is taken from CMA, MSC, China shipping and Hapag Lloyd.

These rates are taken in the month of March and valid for one month only. The rates normally increase or decrease every month. (CMA, MSC, Hapag Lloyd and china shipping, 2016). For getting shipping cost of one 40-foot container CR part and CS part shipping cost is added.

$$\text{Current route shipping cost} = \text{CR road cost} + \text{CS sea freight}$$

Table 16: Current route freight

Origin Port	Destination port	(Taken from table 13) CR (Road freight) (Kashgar-Shanghai)	CS (Sea Freight) (Shanghai to destination ports)	Total freight
Kashgar China	Hamburg	\$2000 - \$2100	\$1900 - \$2000	\$3900 - \$4100
	Le Havre	\$2000 - \$2100	\$1900 - \$2000	\$3900 - \$4100
	Rotterdam	\$2000 - \$2100	\$1900 - \$2000	\$3900 - \$4100
	Jeddah	\$2000 - \$2100	\$1300 - \$1500	\$3300 - \$3600
	Kuwait	\$2000 - \$2100	\$1300 - \$1500	\$3300 - \$3600
	Oman	\$2000 - \$2100	\$1200 - \$1300	\$3200 - \$3400

### 7.1.2 Current route transit time

By adding CR transit time and CS transit time this project calculates the total transit time of current route for one 40-foot container. CR road transit time is calculated in table no 15 while the CS sea transit time is taken from live vessels schedule of CMA line. Link: <https://www.cma-cgm.com/ebusiness/schedules>. By adding both road and sea transit time this thesis calculates the total transit time.

**Current route transit time = CR transit time + CS transit time**

*Table 17: Current route transit time*

<b>Origin Port</b>	<b>Destination port</b>	(Taken from table 15) <b>CR (transit time)</b> (Kashgar – Shanghai)	<b>CS (transit time)</b> (Shanghai to destination ports)	<b>Total transit time</b>
Kashgar China	Hamburg	6 – 7 Days	30 – 35 Days	36 – 42 Days
	Le Havre	6 – 7 Days	30 – 35 Days	36 – 42 Days
	Rotterdam	6 – 7 Days	30 – 35 Days	36 – 42 Days
	Jeddah	6 – 7 Days	15 – 20 Days	21 – 27 Days
	Kuwait	6 – 7 Days	15 – 20 Days	21 – 27 Days
	Oman	6 – 7 Days	12 – 15 Days	18 – 22 Days

Sea transit time is taken from CMA line online schedule. The time of stay on different other ports during journey should not be included.

## **7.2 CPEC route shipping cost and transit time Calculation**

In this section, the thesis calculates the new proposed CPEC route shipping cost and transit time of 40-foot container. This computation shows the shipping cost and transit time of 40-foot container if it's transported through CPEC. CPEC route is also based on road and sea called PR and PS as shown in figure 12. In CPEC route at first step the shipment comes through PR (Pakistan Road) from Kashgar (Western China) to the seaport of Gwadar (Pakistan) and in the second step, it will go from Gwadar seaport to other destination ports by PS (Pakistan Sea). PS (Pakistan Sea) part shipping costs and transit time is easily available from shipping companies. Gwadar port is not yet fully operative and rates are not available so Karachi port is close to Gwadar port and almost has the same distance from all ports of destination. PR (Pakistan road) road costs and transit time is calculated by the gathered data. In the following step this project calculates the PR part road cost and transit time.



### **PR (Pakistan Road) Road cost**

For calculation of PR part inland haulage charge (road cost), the distance of PR part is multiplied by the average per kilometer truck or rail cost. Total distance of PR part is about 2,800 KM according to google maps. The average per kilometer cost is \$0.25 per kilometer that is retrieved from Combined Freight international (Combined freight, 2016). Road costs of different local transporters varies so average cost is utilized to fulfill the requirement. In below mentioned computation, PR part road costs is calculated by multiplying PR distance and average per kilometer cost.

*Table 18: PR road cost*

<b>PR (Pakistan Road) haulage charges</b>			
PR inland haulage charges	Distance in kilometers	*	Per kilometers cost
PR inland haulage charges	2800	*	0.25
PR inland haulage charges	\$700		

Results shows that one 40-foot container will reach at Gwadar from Kashgar at the cost of \$700. Its means inland haulage charges of PR (Pakistan road) part for one 40-foot container is \$700.

### **PR (Pakistan Road) Transit time**

PR part transit time is calculated by dividing total distance of PR part by average truck or rail speed in that region. Distance of PR part is retrieved from google maps and average truck or rail speed got from local transporter such as Combined Freight international (Combined freight, 2016). In some parts, the speed of truck is high up to 80 kph but at mountain area it's dropped to 30 kph or below. Due to that reason average 40 kph is taken to fulfill the requirement.

Table 19: PR Transit time

PR (Pakistan road) Transit time			
PR transit time	Distance in kilometers	/	Average truck or rail speed
PR transit time	2800	/	40
PR transit time	70 hours		

PR transit time between Kashgar (Western China) and Gwadar (Pakistan) is about 70 hours. But other factors should also be considered. Other factors that might increase the road transit time. These factors may include,

- Weather condition,
- Traffic Jam,
- Strikes,
- Law and order situation
- Rest of drivers after long drive.

Special consideration should be given to law and order situation in this route. Because in Pakistan law and order situation is not that much good as much in China. Average 26 hours of delays in transit time put in each journey due to above mention factors. These 26 hours are based on assumption.

Table 20: PR Total Transit time

PR Transit time			
Total CPEC transit time	Current road transit time	+	Average delays
Total CPEC transit time	70 hours	+	26 hours
Total CPEC transit time	96 hours or /4 days		

Results shows that one 40-foot container took 96 hours or 4 days to reach from Kashgar (western China) to Gwadar (Pakistan) through PR.

## 7.2.1 CPEC route Shipping cost

CPEC route is also based on road and sea transport called PR and PS as shown in figure 12. In all cases, origin port is Kashgar (western China). Shipment first reached by PR part to Gwadar (Pakistan) port, then it will move for other destination ports by PS. For calculation of shipping cost of one 40-foot container through CPEC this project adds PR part road cost and PS part sea freight. PR road costs are calculated in table no 18. PS part sea freight for Europe is taken by CMA and MSC lines and sea freight for Middle Eastern countries is taken from CMA, MSC, China shipping and Hapag Lloyd. These rates are taken in the month of March and valid for one month only. The rates are normally increase or decrease every month. (CMA, MSC, Hapag Lloyd and china shipping, 2016). For getting shipping cost of one 40-foot container PR part and PS part shipping costs is added.

$$\text{CPEC route shipping cost} = \text{PR road cost} + \text{PS sea freight}$$

Table 21: CPEC route shipping cost

Origin Port	Destination port	(Taken from table 18) PR (Road freight) (Kashgar- Gwadar)	PS (Sea Freight) (Gwadar to destination port)	Total freight
Kashgar China	Hamburg	\$700 - \$800	\$1800 - \$1900	\$2500 - \$2700
	Le Havre	\$700 - \$800	\$1800 - \$1900	\$2500 - \$2700
	Rotterdam	\$700 - \$800	\$1800 - \$1900	\$2500 - \$2700
	Jeddah	\$700 - \$800	\$900 - \$1000	\$1600 - \$1800
	Kuwait	\$700 - \$800	\$900 - \$1000	\$1600 - \$1800
	Oman	\$700 - \$800	\$300 - \$400	\$1000 - \$1200

## 7.2.2 CPEC route transit time

CPEC transit time is calculated by adding PR part transit time and PS part transit time. PR transit time is calculated in table no 20 while the PS part sea transit time is taken from live vessels schedule of CMA line.

Link: <https://www.cma-cgm.com/ebusiness/schedules>. By adding PR transit time and PS transit time this thesis should calculate the total transit time of one 40-foot container that is transported through CPEC route.

Table 22: CPEC route transit time

Origin Port	Destination port	(Taken from table 20) PR (transit time) (Kashgar- Gwadar)	PS (transit time) (Gwadar to destination port)	Total transit time
Kashgar China	Hamburg	3 – 4 Days	23 – 27 Days	26 - 31 Days
	Le Havre	3 – 4 Days	23 – 27 Days	26 - 31 Days
	Rotterdam	3 – 4 Days	23 – 27 Days	26 - 31 Days
	Jeddah	3 – 4 Days	7 – 10 Days	10 - 14 Days
	Kuwait	3 – 4 Days	3 – 5 Days	6 - 9 Days
	Oman	3 – 4 Days	5 – 8 Days	8 - 12 Days

Sea transit time is taken from CMA line online schedule. Transit time should start from cutoff of vessels till they reach the destination. The time of stay on different other ports during journey should not be included.

## 8 FINDINGS

This chapter briefly describes the project findings that is calculated in chapter 7. First section of this chapter describes the impact on imports and exports in term of shipping cost and transit time or in other word first chapter answer the first research question of thesis.

In second section of this chapter, current route and CPEC route is compared on the bases of shipping cost and transit time. This section enables that study to give recommendation about the selection of shipping route. In third section of this chapter distance of current route and new CPEC route is compared.

## **8.1 Impact on imports & export in term of shipping cost and delivery time (RQ 1)**

The first objective of the study is to find the impact of CPEC on Chinese supply chain of imports and exports. CPEC will put impact in two dimensions in sense of shipping cost and transit time. Chapter number 6 shows that total volume of trade from the selected destination is about \$406 billion. Total exports of China in 2013 to selected destination countries are about \$212.46 billion dollars. On the other hand, total imports from selected destination countries are about \$193.53 billion dollars. Results of chapter 7 show that there is a positive impact on the shipping cost and delivery time.

The shipping costs will be reduced by \$1400 with each 40-foot container that is imported or exported from a European destination. Transit time will be decreased by 10 to 11 days from European countries.

For Middle Eastern countries on which China heavily relies on fulfilling its energy requirement, the shipping cost will be reduced by \$1700 to \$2200, and transit time from 11 to 18 days on each 40- foot container.

China would not only enjoy the smaller shipping cost and transit time of its export but China would also enjoy the benefit of importing the raw materials that should be cheap because of low shipping cost with quicker delivery. Shipping costs for Europe decrease by 36%, for Saudi Arabia and Kuwait by 50% and for Oman 68%. Irrespective of that percentages this study assumes that if supply chain save 10% for total trading volume between China and destination countries than results should be as follows.

Table 23: Overall impact of CPEC

Ports	Exports	Imports	Total trading Volume	10 % save
Germany	\$92.50	\$87.4	\$179.90	\$17.99
France	\$50.40	\$20.00	\$70.40	\$7.04
Netherland	\$44.70	\$10.3	\$55.00	\$5.50
Saudi Arabia	\$19.80	\$48.00	\$67.80	\$6.78
Kuwait	\$3.85	\$8.93	\$12.78	\$1.278
Oman	\$1.21	\$18.90	\$20.11	\$2.011
<b>Total</b>	<b>\$212.46</b>	<b>193.53</b>	<b>\$405.99</b>	<b>\$40.599</b>

This table shows that supply chain can save about \$41 billion dollars on all the exports and imports that it made from selected destinations. CPEC route will not only save the shipping cost, but it seems that due to new CPEC route the distance should be reduced from about 10,000 to 11,000 km so transit time of trade should reduce. Shorter route enables the quick delivery of goods. The aim of every producer is to ensure that the finished goods should reach in the hand of the customers in time. The calculation of the thesis shows that supply chain can save shipping cost of about \$ 41 billion dollars. This calculation is only for the three European ports and three Middle Eastern ports but China can shift all its European and Middle Eastern trade on CPEC route. By doing trade with European and Middle Eastern countries, using CPEC route China can save billions of dollars in supply chain. The competitive advantage that China gains in the form of quicker delivery is also very big and uncountable benefit.

## 8.2 Comparison of current route shipping cost and delivery time with CPEC (RQ 2)

The second objective of the thesis is to compare the current route shipping costs and transit time with CPEC route shipping costs and transit time. The data of chapter 7 is used for comparisons.

### 8.2.1 Comparison of Shipping Cost

In the table given below, the current shipping costs of 40-foot container between port of origin and six destination ports, three from Europe (Hamburg, Le Havre and Rotterdam) and three from Middle East (Jeddah, Kuwait and Oman) is compared with new CPEC route. In this computation current route shipping cost is subtracted from CPEC route shipping costs and the impact is measured. In the difference column, green color shows the positive impact, meaning reduction in shipping costs and red color shows the negative impact i.e. increase in shipping costs.

Table 24: Comparison of shipping cost between Current route and CPEC route

Origin Port	Destination port	(Taken from Table 16)	(Taken from Table 21)	Difference
		Current route Shipping cost	CPEC route shipping cost	
Kashgar China	Hamburg	\$3900 - \$4100	\$2500 - \$2700	\$1400
	Le Havre	\$3900 - \$4100	\$2500 - \$2700	\$1400
	Rotterdam	\$3900 - \$4100	\$2500 - \$2700	\$1400
	Jeddah	\$3300 - \$3600	\$1600 - \$1800	\$1700 - \$1800
	Kuwait	\$3300 - \$3600	\$1600 - \$1800	\$1700 - \$1800
	Oman	\$3200 - \$3400	\$1000 - \$1200	\$2200

Above table shows the positive impact in term of shipping cost. China should able to save \$1400 on each 40-foot container that is imported or exported from Europe. New route shipping costs is about 36 % less as compare to current route shipping cost. Results also shows that on each 40-foot container from Jeddah and Kuwait, China should pay shipping costs up to \$1700 to \$1800, which is half of the current shipping cost. Its means China can save 50% shipping cost on all its imports of oil which China made from Saudi Arabia and Kuwait. China should save \$2200 from each 40-foot container that import or export to Oman. The reduction in the shipping cost of Oman is about 68% as compare of current shipping cost.

### 8.2.2 Comparison of Transit Time

In a given below table current transit time of 40-foot container between Kashgar (China) and six destination ports, three from Europe (Hamburg, Le Havre and Rotterdam) and three from Middle East (Jeddah, Kuwait and Oman) is compared with new CPEC route. In this computation current route transit time is subtracted from CPEC route transit time and the impact is measured. In the difference column green color shows the positive impact that means reduction in transit time and red color shows the negative impact i.e. increase in transit time.

Table 25: Comparison of transit time between Current route and CPEC route

Origin Port	Destination port	(Taken from Table 17)	(Taken from Table 22)	Difference
		Current route Transit Time	CPEC route Transit time	
Kashgar China	Hamburg	36 – 42 Days	26 - 31 Days	10 – 11 Days
	Le Havre	36 – 42 Days	26 - 31 Days	10 – 11 Days
	Rotterdam	36 – 42 Days	26 - 31 Days	10 – 11 Days
	Jeddah	21 – 27 Days	10 - 14 Days	11 – 13 Days
	Kuwait	21 – 27 Days	6 - 9 Days	15 - 18 Days
	Oman	18 – 22 Days	8 - 12 Days	10 Days

Green color shows the positive impact on transit time. Result shows that China is able to save 10 to 11 days from all the imports and exports that made to all over Europe. On the other hand, China is able to save 10 to 18 days of transit time on all imports and exports that comes or go to Middle Eastern countries on which China is heavily relying for fulfilling the energy requirement.

### 8.3 Distance Comparison

This computation finds the distance of current route and CPEC route from port of origin to ports of destination. After finding the distance both distances compared and checked that either distance increase or decrease due to new CPEC route. CS and PS (sea dis-



tance of both routes) taken from the website <http://www.sea-distances.org/>. Shortest route distance is used for each case, which is passing through Suez Canal. CR and PR (road distance of both routes) is taken from google maps.

### 8.3.1 Current route distance

This computation finds the current distance between the port of origin and ports of destination. Current route is based on road and sea called CR and CS shown in figure 11. By adding distance of CR and CS part of current route this study finds the current route distance. Sea distance usually given in nautical miles but it is converted into kilometers and get the final answer in kilometers. For changing nautical miles into kilometers the distance of sea is multiplied by 1.852.

$$\text{Total current route distance} = \text{CR distance} + \text{CS distance}$$

Table 26: Current route Distance

Origin Port	Destination port	CR part Distance (Kashgar to Shanghai)	CS part distance	Total current route distance in KM
Kashgar China	Hamburg	5,153	10,778nm x 1.852 = 19,961km	25,114
	Le Havre	5,153	10,320nm x 1.852 = 19,113km	24,266
	Rotterdam	5,153	10,525nm x 1.852 = 19,492km	24,645
	Jeddah	5,153	6,558nm x 1.852 = 12,145km	17,298
	Kuwait	5,153	6,062nm x 1.852 = 11,227km	16,380
	Oman	5,153	5,389nm x 1.852 = 9,980km	15,133

### 8.3.2 CPEC route distance

New CPEC route is also based on road and sea called PR and PS as shown in figure 12. By adding PR distance and PS distance this study calculates the total new route distance from port of origin to ports of destination. Gwadar port is not yet operative. Due to that reason distance from Karachi port to port of destination is used to fulfill the requirement. CR part distance is retrieved from google maps.

$$\text{CPEC route distance} = \text{PR distance} + \text{PS distance}$$

Table 27: CPEC route distance

Origin Port	Destination port	PR part Distance (Kashgar to Gwadar)	PS part distance	Total CPEC route distance in KM
Kashgar China	Hamburg	2,800	6,386nm x 1.852 = 11,827km	14,627
	Le Havre	2,800	5,928nm x 1.852 = 10,979km	13,779
	Rotterdam	2,800	6,133nm x 1.852 = 11,358km	14,158
	Jeddah	2,800	2,166nm x 1.852 = 4,011km	6,811
	Kuwait	2,800	1,087nm x 1.852 = 2,013km	4,813
	Oman	2,800	467nm x 1.852 = 865km	3,665

### 8.3.3 Comparison of distance

By taking difference of current route distance and CPEC route distance this study tells how much the distance increases or decreases due to the new route. Numbers in green show the decrease in distance while number in red shows the increase in distance due to new CPEC route.

Table 28: Distance comparison of Current route and CPEC route

Origin Port	Destination port	Current route Distance	CPEC route Distance	Difference in KM
Kashgar China	Hamburg	25,114	14,627	10,487
	Le Havre	24,266	13,779	10,487
	Rotterdam	24,645	14,158	10,487
	Jeddah	17,298	6,811	10,487
	Kuwait	16,380	4,813	11,567
	Oman	15,133	3,665	11,468

Results shows that due to new CPEC route China is able to save the distance of up to 10,000 to 11,000 Km. That is a huge benefit that can not only decrease the transit time but also the shipping costs. After completing new route, China is able to deliver goods faster as compared to current transit time and with less shipping cost. CPEC route makes China's trade more competitive in terms of fast delivery and low cost.

## **9 DISCUSSION AND CONCLUSION**

This chapter includes the discussion and recommendations, which are based on the above calculated results.

### **9.1 Recommendation**

After looking into the results it is easy to say that companies should choose the new CPEC route because it is cost efficient in terms of shipping cost and transit time. Producers want to receive the raw material on time and also want the finished goods in the hand of a customer as soon as possible. This should happen due to a fast and reliable supply chain network. Most important activity of supply chain network is transportation. Good transportation enables the supply of raw material on time and also enables the timely supply of finished goods to customer. Transportation plays a double role in the supply chain network. At the first stage transportation moves raw material for production and at the second stage transportation moves finished goods for consumption. Good infrastructure of transportation enables quicker, faster and cheaper delivery.

### **9.2 Conclusion**

The main aim of the thesis basically relates with the theory of whether the CPEC has an impact on shipping costs and transit time or not. In the theory, this study tries to establish the importance of logistics in a supply chain network and narrow down the importance of shipping costs and transit time.

Logistics is the backbone of a supply chain network. It is used as inbound and outbound transportation. In transportation the most important and valuable thing is shipping costs

and transit time. The aim of every business or organization is to minimize the logistics cost and reduce the delivery time or transit time, because everyone wants the finished goods in the hand of the customer in time. So, the established truth is that every business wants less expensive transport with timely delivery.

China is the world's largest exporter and importer of goods and services. Currently, according to atlas media OEC total volume of China exports are \$2.25 trillion and ranks first in the world. Imports volume of China is \$1.56 trillion dollar and ranks second in the world. (Atlas media OEC, 2013)

Selected destination countries are big trading partners of China. China imports oil in large quantities for fulfilling its energy requirement from Middle Eastern countries. China needs an alternative route that should be fast, safe and reliable as well. In this manner China can save billions of dollars from shipping cost. China will not only save the shipping cost but also save transit time.

The first objective of the study is to find the impact of CPEC on imports and exports of China. Results show that supply chain would able to save about \$41 billion on its imports and exports from selected destinations in term of shipping cost. It seems that due to new CPEC route the distance should reduce by about 10,000 to 11,000 km so transit time of trade should reduce. Shipping costs should also reduce because of shorter route.

Table 24 shows that there is a positive impact in terms of shipping cost on China imports and exports. Due to new CPEC route, China is able to save up to \$1,400 on each 40-foot container that is imported or exported from Europe. Proposed route is 36% cheaper as compared to current route. Results also show that on each 40-foot container from Jeddah and Kuwait, China should save shipping cost up to \$1,700 to \$ 1,800, which is half of the current shipping cost. China can save \$2,200 from each 40-foot container that is imported or exported to Oman. That is 68% reduction as compared to current shipping cost of Oman.

Reduction of \$1,400 to \$2,200 on each container that is either imported or exported should decrease China's cost of goods. China's cost of goods decreases in two dimen-

sions. Reduction in shipping cost decreases the cost of raw material that China imports from different countries. Cheaper raw material will be available for production. Not only raw material but also energy or fuel should be available at a cheaper rate.

China's exporters have to pay less shipping cost due to which they can reduce the sale price. By reducing prices and quicker delivery the products of China become more competitive in the global market.

The results of the study also show that China is able to save a transit time of 10 to 11 days on all its imports and exports that China made with all over Europe. On the other hand, China is able to save 10 to 18 days of transit time on all imports and exports that comes or go to Middle Eastern countries on which China is heavily relying for fulfilling the energy requirement. Fast delivery enables China to become more competitive in the market.

As it is mentioned earlier that CPEC is a game changer for the region not only Pakistan and China will get benefits but all other countries benefited as well. Definitely the companies of other countries which exports the goods and services to China would like to use the proposed route because of less shipping cost and transit time. Land locked central Asian countries (Afghanistan, Kyrgyzstan, Kazakhstan, Tajikistan, Turkmenistan, and Uzbekistan) would also get the benefits of shortest way to sea port of Gwadar only 2500 km as comparing to Iran 4500 km and Turkey 5000 km.

This route not only serves China but also European countries, Middle Eastern countries and land locked central Asian countries.

## REFERENCES

Atlas media OEC, 2013 "The observatory of economic Complexity" Macro connections.<http://atlas.media.mit.edu/en/profile/country/chn/>(Accessed 15 March, 2016)

AW Logistics, 2016 Ghufuran Khan, Local transporter Karachi, Suite no 332, 3rd Floor, AL Rehman Trade Centre, New Challi, Shahrah-e-Liaquat, Karachi, Pakistan.  
<http://awlpak.com>.

Bowersox, D.J., Closs, D.J. and Stank, T.P. (2000), "Ten-mega trends that will revolutionize supply chain logistics", *Journal of Business Logistics*, Vol. 21 No. 2, pp. 1-15 (Accessed 21 Nov, 2015)

BOI, 2015 Board of Investment Pakistan, "CPEC Portfolio of investment"  
<http://boi.gov.pk/Home.aspx> (Accessed 05 Jan, 2016)

BMA capital, 2015 Pakistan Economy "Impact of china Pakistan economic corridor, a bird eye view" <http://res.bmacapital.com/> (Accessed 15 Feb, 2016)

Christopher, M. (1998) *Logistics & Supply Chain Management*, Financial Times Professional Limited, London. In Jan Stentoft Arlbjørn *Northern Lights in Logistics & Supply Chain Management*,: Strategies for Reducing Cost and Improving Service, (Accessed 12 Nov, 2015)

Chang, Y.H. (1998) *Logistical Management*. Hwa-Tai Bookstore Ltd., Taiwan in M Sreennivas "THE ROLE OF TRANSPORTATION IN LOGISTICS CHAIN".URL: <https://www.siam.org/journals/plagiary/1814.pdf> (Accessed 25 Nov, 2015)

Council of Supply Chain Management Professionals (CSCMP) URL: <https://cscmp.org/research/organizing-supply-chains-time-change> (Accessed 20 Nov, 2015)

Chowdhary Mahwish, August 25, 2015. "China's Billion-Dollar Gateway to the Sub-continent: Pakistan May Be Opening A Door It Cannot Close" Forbes Opinion URL: <http://www.forbes.com/sites/realspin/2015/08/25/china-looks-to-pakistan-to-expand-its-influence-in-asia/> (Accessed 20 Oct)

Crosby, P.B. (1979), "Applying selected quality management techniques to diagnose delivery time variability", *The International Journal of Quality & Reliability Management*, vol. 28, no. 9, pp. 1019-1040. (Accessed 10 Dec, 2015)

Christopher, M. (2010), *Logistics and Supply Chain Management*, 4th ed., FT-Prentice Hall, Harlow (Accessed 6 Dec, 2015)

CIA: The World Fact book. "Pakistan." Updated: 05 May 2016. <https://www.cia.gov/library/publications/the-world-factbook/geos/pk.html>. (Accessed 12 Feb, 2016)

CMA, CGM Shipping regional office Karachi Pakistan (March, 2016)

Combined freight international, freight forwarder consolidator Karachi (Head Office) Office 4 & 6, 7th Floor, Arkay Square (Ext.) Shahrah-e-Liaquat, New Challi, Karachi. <http://www.cfipak.com/contact%20us.html>

Durvasula, Srinivas, Steven Lysonski, and Subhash C. Mehta (2000), "Business-to-Business Marketing: Service Recovery and Customer Satisfaction Issues with Ocean Shipping Lines," *European Journal of Marketing*, Vol. 34, No. 3/4, pp. 433-452 (Accessed 10 Dec, 2015)

Dr Hafiz A Pasha, 2014 "Economy of tomorrow" case study of Pakistan <http://library.fes.de/pdf-files/bueros/pakistan/10786.pdf> (Accessed 10 Feb, 2016)

Esper, T.L., Fugate, B.S. and Davis-Sramek, B. (2007), "Logistics learning capability: sustaining the competitive advantage gained through logistics leverage", *Journal of Business Logistics*, Vol. 28 No. 2, pp. 57-82 (Accessed 24 Nov, 2015)

Fred N. Horning, John McCann, Jan, 2003. "Cycle Time Reduction Gives Life to Productivity" Inbound logistics. <http://www.inboundlogistics.com/cms/article/cycle-time-reduction-gives-life-to-productivity/> (Accessed 8 Dec, 2015)

Fang, Y. and Ng, S.T. (2007), "Analysis of resource acquisition cost for construction project logistics", in Hughes, W. (Ed.), Proceedings of the Construction Management and Economics 25th Anniversary Conference, University of Reading, Reading, UK, July 16-18, Taylor & Francis, Oxford, 8 pages. (Accessed 3 Dec, 2015)

Gateway of Pakistan, 2016 <http://www.pakistan.gov.pk/> (Accessed 16 march, 2016)

Inp, August 19, 2015 "Game-changing" China-Pakistan Economic Corridor gains momentum in Pakistan". <http://www.pakistantoday.com.pk/2015/08/19/national/game-changing-china-pakistan-economic-corridor-gains-momentum-in-pakistan/> (Accessed 20 Nov, 2015)

InformationWeek (2003), "Supply chain management still a work in progress", InformationWeek, May 23 in Sherer, S.A. 2005, "From supply-chain management to value network advocacy: implications for e-supply chains", Supply Chain Management, vol. 10, no. 2, pp. 77-83. (Accessed 10 Nov, 2015)

Joseph Sarkis, (2012) "A boundaries and flows perspective of green supply chain management", Supply Chain Management: An International Journal, Vol. 17 Iss: 2, pp.202 – 216 (Accessed 16 Nov, 2015)

Jayaram, J., Vickery, S.K. and Droge, C. (2000), "The effects of information system architecture and process improvements on supply-chain time performance", International Journal of Physical Distribution & Logistics Management, Vol. 30 Nos 3/4, pp. 314-24 (Accessed 8 Dec, 2015)

Jang News, 2016 [jang.com.pk/latest/77090-shahrah-e-karakoram-closed-on-various-points-due-to-rain-and-landsliding](http://jang.com.pk/latest/77090-shahrah-e-karakoram-closed-on-various-points-due-to-rain-and-landsliding) (Accessed 15 April, 2016)



Kanakamedala, K., Ramsdell, G. and Srivatsan, V. (2003), "Getting supply chain software right", McKinsey Quarterly, No. 1 (Accessed 8 Nov, 2015)

Keaveney, S. M. (1995). Customer switching behavior in service industries: An exploratory study. *Journal of Marketing*, 59(2), 71–82. (Accessed 8 Dec, 2015)

Kazi.s Ahmed, 1951 "Pakistan geographical review volume VI no 1. <http://pu.edu.pk/images/journal/geography/pdf/> (Accessed 10 Jan, 2016)

Laseter, T. and Oliver, K. (2003), "When will supply chain management grow up?", *Strategy + Business*, No. 32, pp. 20-5 (Accessed 12 NOV, 2015)

Mentzer, J.T., Flint, D.J. and Hult, G.T.M. (2001), "Logistics service quality as a segment-customized process", *Journal of Marketing*, Vol. 65 No. 4, pp. 82-104. (Accesses 24 Nov, 2015)

Mentzer, J.T., Min, S. and Bobbitt, L.M. (2004), "Toward a unified theory of logistics", *International Journal of Physical Distribution and Logistics Management*, Vol. 34 No. 8, pp. 606-627 (Accessed 10 Nov, 2015)

McGinnis, M.A. 1992, "Military Logistics: Insights for Business Logistics", *International Journal of Physical Distribution & Logistics Management*, vol. 22, no. 2, pp. 22. (Accessed 17 Nov, 2015)

Muhammad Daim fazil, May 29. 2015 "The China-Pakistan Economic Corridor: Potential and Vulnerabilities" *The diplomat*. <http://thediplomat.com/2015/05/the-china-pakistan-economic-corridor-potential-and-vulnerabilities/>. (Accessed 24 nov, 2015)

Merriam-Webster (1973), *Webster's New Collegiate Dictionary*, G. and C. Merriam Company, Springfield, MA (Accessed 10 Nov, 2015)

M.Sreenivas, Dr. T. Srinivas, 2008 THE ROLE OF TRANSPORTATION IN LOGISTICS CHAIN. <https://www.siam.org/journals/plagiary/1814.pdf> (Accessed 25 Nov, 2015)

Mary J. Meixell, Mario Norbis, (2008) "A review of the transportation mode choice and carrier selection literature", *The International Journal of Logistics Management*, Vol. 19 Iss: 2, pp.183 – 211 (Accessed 18 Oct, 2015)

Monczka, R., Trent, R. and Handfield, R. (2005), *Purchasing and Supply Chain Management*, Thomson South-Western, Mason, OH. (Accessed 28 Nov, 2015)

MSC Mediterranean shipping company, MSC Agency Pakistan (Private) Ltd., Faysal bank Building, 1st Floor, 16, Abdullah Haroon Road, Karachi - 74000  
Pakistan shipping lines, regional office of Karachi.

NHA, Pakistan, 2016 National highway authority Pakistan "CPEC projects maps" <http://nha.gov.pk/en/> (Accessed 10 Jan, 2016)

Pedersen, E.L. and Gray, R. (1998), "The transport selection criteria of Norwegian exporters", *International Journal of Physical Distribution & Logistics Management*, Vol. 28 No. 2, p. 108 (Accessed 1 Dec, 2015)

Philipp Goebel, Sabine Moeller, Richard Pibernik, (2012) "Paying for convenience: Attractiveness and revenue potential of time-based delivery services", *International Journal of Physical Distribution & Logistics Management*, Vol. 42 Iss: 6, pp.584 – 606 (Accessed 8 Dec, 2015)

Pak met, 2010 "Pakistan Weather Report Karachi, Islamabad, Lahore" <http://www.pakmet.com.pk/latest%20news/Latest%20News.html> (Accessed 3 march, 2016)

Ramachandran Balakrishna, June, 2006. Off-line Calibration of Dynamic Traffic Assignment Model. (Accessed 9 Dec, 2015)

Russell, R. and Taylor, B. (2003), *Operations Management*, Prentice-Hall, Upper Saddle River, NJ (Accessed 28 Nov, 2015)

Reimann, B. (1989), "Sustaining the competitive advantage", *Planning Review*, Vol. 17, pp. 30-9. (Accessed Dec, 1 2015)

Shan, L., Zhang, Z., Wang, X., & Chen, Z. (2011). Integration of logistics resources based on logistics network. *Contemporary Logistics*, (3), 51-56. Retrieved from <http://search.proquest.com/docview/1355496723?accountid=27294> (Accessed 21 Nov, 2015)

Selviaridis, K. and spring, M. (2007), "Third party logistics: a literature review and research agenda", *The International Journal of Logistics Management*, Vol. 18 No. 1, pp. 125-50 (Accessed 2 Dec, 2015)

Shih-Chan Ting, a. G. (2003). Ship scheduling and cost analysis for route planning in liner shipping. *Maritime Economics & Logistics*, 5(4), 378-392. Retrieved from <http://search.proquest.com/docview/194537665?accountid=27294> (Accessed 27 Nov, 2015)

Seiders, K., Glenn B. Voss, Dhruv Grewal, and Andrea L. Godfrey (2007): "SERVCON: Development and Validation of a Multidimensional Service Convenience Scale," *Journal of the Academy of Marketing Science*, 35 (1), 144-156. (Accessed 9 Dec, 2015)

Skjoett-Larsen, T. 2000, "European logistics beyond 2000", *International Journal of Physical Distribution & Logistics Management*, vol. 30, no. 5, pp. 377-387. (Accessed 8 Dec, 2015)

Saldanha, J.P., Russell, D.M. & Tyworth, J.E. 2006, "A Disaggregate Analysis of Ocean Carriers' Transit Time Performance", *Transportation Journal*, vol. 45, no. 2, pp. 39-60. (Accessed 10 Dec, 2015)

Shipping goods and materials could cost less", 2001, *CabinetMaker*, vol. 15, no. 11, pp. 26-27. (Accessed 10 Dec, 2015)

Sahin, F. & E, P.R. 2002, "Flow coordination and information sharing in supply chains: Review, implications, and directions for future research", *Decision Sciences*, vol. 33, no. 4, pp. 505-536. (Accessed 7 Dec, 2015)

Trent, R.J. and Monczka, R.M. (1999), "Achieving world-class supplier quality", *Total Quality Management*, Vol. 10 No. 6, pp. 927-38 (Accessed 8 Dec, 2015)

Tuli, K.R., Kohli, A.K., Bharadwaj, S.G. (2007), "Rethinking Customer Solutions: From Product Bundles to Relational Processes", *Journal of Marketing*, Vol 71, No 3, 1–17. (Accessed 8 Dec, 2015)

Tavia Grant (8 December 2011). "On 10th birthday, BRICs poised for more growth". *The Globe and Mail* (Toronto)

Trading economies "Pakistan economy"

<http://www.tradingeconomics.com/pakistan/gdp> (Accessed 15 Dec, 2015)

The your web, 2015, [www.theyourweb.blogspot.fi/2015/08/pakistan-map-pakistan-maps-pakistan-map.html](http://www.theyourweb.blogspot.fi/2015/08/pakistan-map-pakistan-maps-pakistan-map.html)

Wegelius-Lehtonen, T. (2001), "Performance measurement in construction logistics", *International Journal of Production Economics*, Vol. 69 No. 1, pp. 107-16 (Accessed 3 Dec, 2015)

Wisner, J., Leong, G. and Tan, K. (2005), *Principles of Supply Chain Management. A Balanced Approach*, Thomson South-Western, Manson, OH (Accessed 2 Dec, 2015)

World Bank Climate Change Knowledge Portal; Climate Research Unit, University of East Anglia [http://data.worldbank.org/country/pakistan#cp\\_cc](http://data.worldbank.org/country/pakistan#cp_cc) (Accessed 05 March, 2016)