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THE ARCHITECTURE OF THE BELT AND ROAD INITIATIVE

Feasibility Study on Sustainable Development of Free Trade Zone Made by BRI

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Abstract

As early as 2,200 years ago, goods, culture and population traveled through routes that connected ancient China and Mediterranean countries, and these routes later became known as the Silk Roads. based on the concept of the ancient Silk Road, China's President Xi Jinping first proposed Belt and Road Initiative (BRI) in 2013. BRI (the contemporary silk road) combines two initiatives: The Silk Road Economic Belt (land based), and The 21st Century Maritime Silk Road. Facts have shown that the "Belt and Road Initiative" has become the world's widest and largest international cooperation platform.

Since the core of BRI's development lies in the economic and trade exchanges between the China and world, the construction or strengthening of related transportation networks and the development of domestic and foreign free trade zones (which can also be regarded as one of the node types of BRI's transportation network) are the most important one of the investment directions. However, BRI still faces many challenges in the process of promoting development, one of which is that some governments and scholars doubt the sustainability of its development. The construction of free trade zones (ports) accounts for a large proportion of BRI's projects. However, solving the environmental sustainability issues of these projects is a global challenge. This article mainly aims to explore the feasibility of BRI's free trade zone construction in terms of sustainable development, with one of BRI's partners, the Port of Venice's sustainable feasibility as the research conclusion.

During the research process, three free trade zone (port) projects in cooperation with BRI were selected as case studies, namely: The Port City of Colombo (Sri Lanka), The Djibouti International Free Trade Zone (Republic of Djibouti), Piraeus Port (Greece).

Keywords

Belt and Road Initiative (BRI), Sustainable Technology, Free Trade Zone, Logistics, Port

Chapter 1. What is BRI

1.1 Introduction

Since the 2008 international financial crisis, especially after Xi Jinping came to power, China's foreign policy has become more confident. In this context, the "Belt and Road Initiative" (BRI) is not only a response to China's domestic needs and international challenges, but also a suitable medium long-term strategy to reshape the world order.

Xi Jinping, China's President of the initiative in a speech entitled "Promoting civil friendship for a better future", first proposed, based on the concept of the ancient Silk Road and its cultural, political, religious and knowledge of ancient history. China and Central Asia, the peoples of Europe in trade, commerce on friendly exchanges, through large-scale investment in the construction of railways, ports and airports and maritime networks, energy, telecommunications and Internet infrastructure, to create a "win-win" new model of cooperation, and promote the Internet Intercommunication, sharing peace and development. (Aguinaldo 2017) President Xi mentioned, the "Belt and Road Initiative" is more than just a vision. Institutions such as the Asian Infrastructure Investment Bank (AIIB), the Silk Road Fund (SRF), and the Belt and Road Forum (BRF) have been established to "provide funds for infrastructure construction and promote regional connectivity and economic integration". Ma Junchi, an assistant professor at the Institute of European Studies of the Chinese Academy of Social Sciences, said, " Some of the most successful initiatives include the New-Europe Transcontinental Railway connecting inland China to European cities , which are important for cargo transportation between Asia and Europe." ; The port of Piraeus in Greece and the China-Europe-Europe Sea Express line through Macedonia, Serbia and Hungary will help shorten the transportation time; Indonesia, Thailand and other Asian countries also have in-depth cooperation with China in high-speed rail.

Today, almost all of China's diplomatic policies and activities are carried out around the concept of the New Silk Road. China's goal is to " build a new integration of Afro-Eurasia, establish a barrier-free in a global perspective or multi-order trade, investment, the people communicating order, in this order, as there are countries can exercise their pursuit of their own the right to development and governance of the road. " Some countries indicated by Asia, Europe and Africa more closely together to create a new global growth.

1.1.1 Historical Background

As early as 2,200 years ago, goods, culture and population traveled through routes that connected ancient China and Mediterranean countries, and these routes later became known as the Silk Roads. It is open to those adventurous and brave people who have connected civilization for centuries. In ancient China, there were Zhang Qian and Xuanzang, and in Europe there was Marco Polo. These pioneers all completed economic and cultural exchanges along the Silk Road. The civilizations on both ends of the Eurasian continent are firmly connected together.

The ancient Silk Road consists of two routes which are the land Silk Road and the maritime Silk Road. Many reports said that in 1877, the geological geologist Mr. Richthofen also wrote in his book 'China' that "from 114 BC to 127 AD, the western traffic road between China and Central Asia, China and India, which uses silk trade as the medium " named "Silk Road".

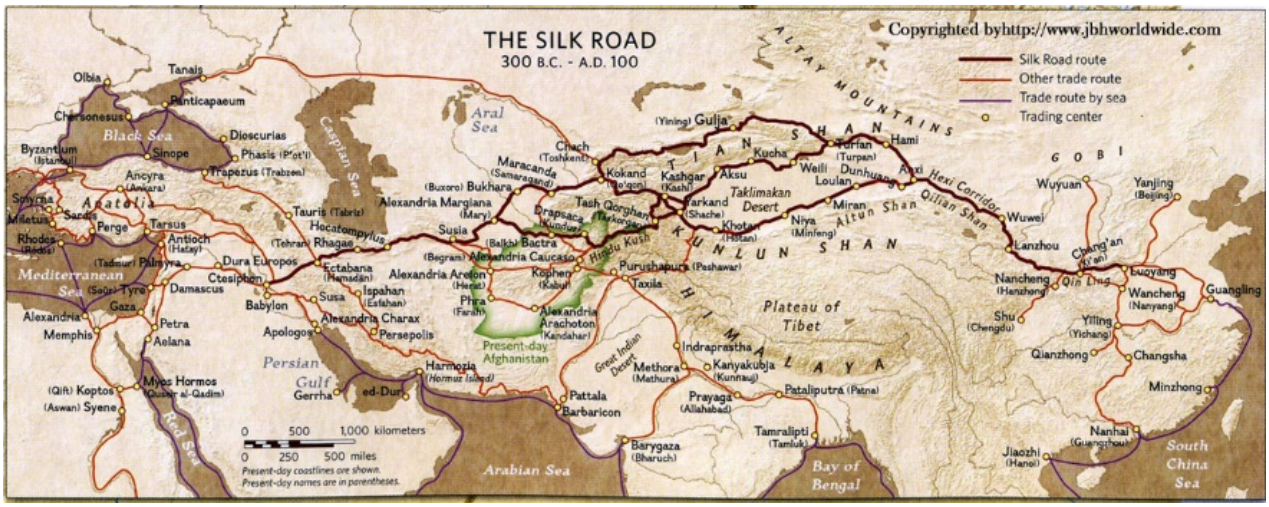

Figure 1: Ancient Silk Road, Source: https://hannahromanowsky.com/migrations-and-cultural-encounters-afghanistan/

1.1.2 Route and Scope

BRI is a global initiative, but due to its long-standing nature on the Silk Road, it mainly focuses on countries in Asia, East Africa, Eastern Europe, and the Middle East. The region is mainly composed of emerging markets. According to the "Belt and Road" portal website, 71 countries currently participate in the "Belt and Road" initiative, accounting for more than one-third of the world's GDP and two-thirds of the world's population.

The BRI combines two initiatives:

1. The (land based) Silk Road Economic Belt, comprising six development corridors
2. The 21st Century Maritime Silk Road

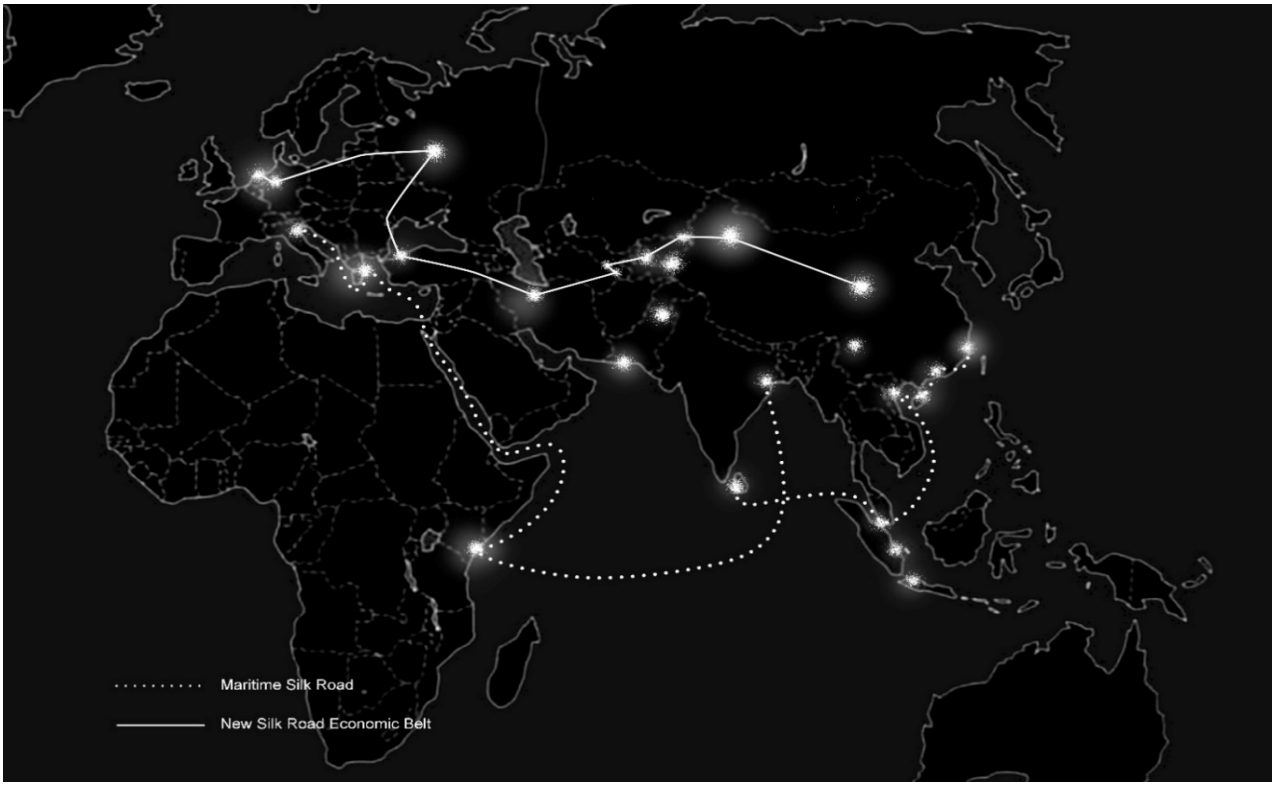

Figure 2: Routes of the Belt and Road, (drawn by author), Data source: https://merics.org/en/tracker/mapping-belt-and-road-initiative-where-we-stand

The Silk Road Economic Belt Strategy covers the economic integration of Southeast Asia and Northeast Asia, and eventually merges to Europe, forming a general trend of economic integration in Eurasia. 21st Century Maritime Silk Road Economic Belt.
Strategy connects the three continents of Eurasia and Africa by sea and the Silk Road Economic Belt Strategy to form a closed loop through sea and land.

The Silk Road Economic Belt is a long-term vision for the infrastructural development, connectivity and economic cooperation of Eurasia and is spanning 6 develop "corridors", namely:
1. New Eurasian Land Bridge Economic Corridor (NELBEC)
2. China – Mongolia – Russia Economic Corridor (CMREC)
3. China – Central Asia – West Asia Economic Corridor (CCWAEC)
4. China – Indochina Peninsula Economic Corridor (CICPEC)
5. Bangladesh – China – India – Myanmar Economic Corridor (BCIMEC)
6. China – Pakistan Economic Corridor (CPEC)

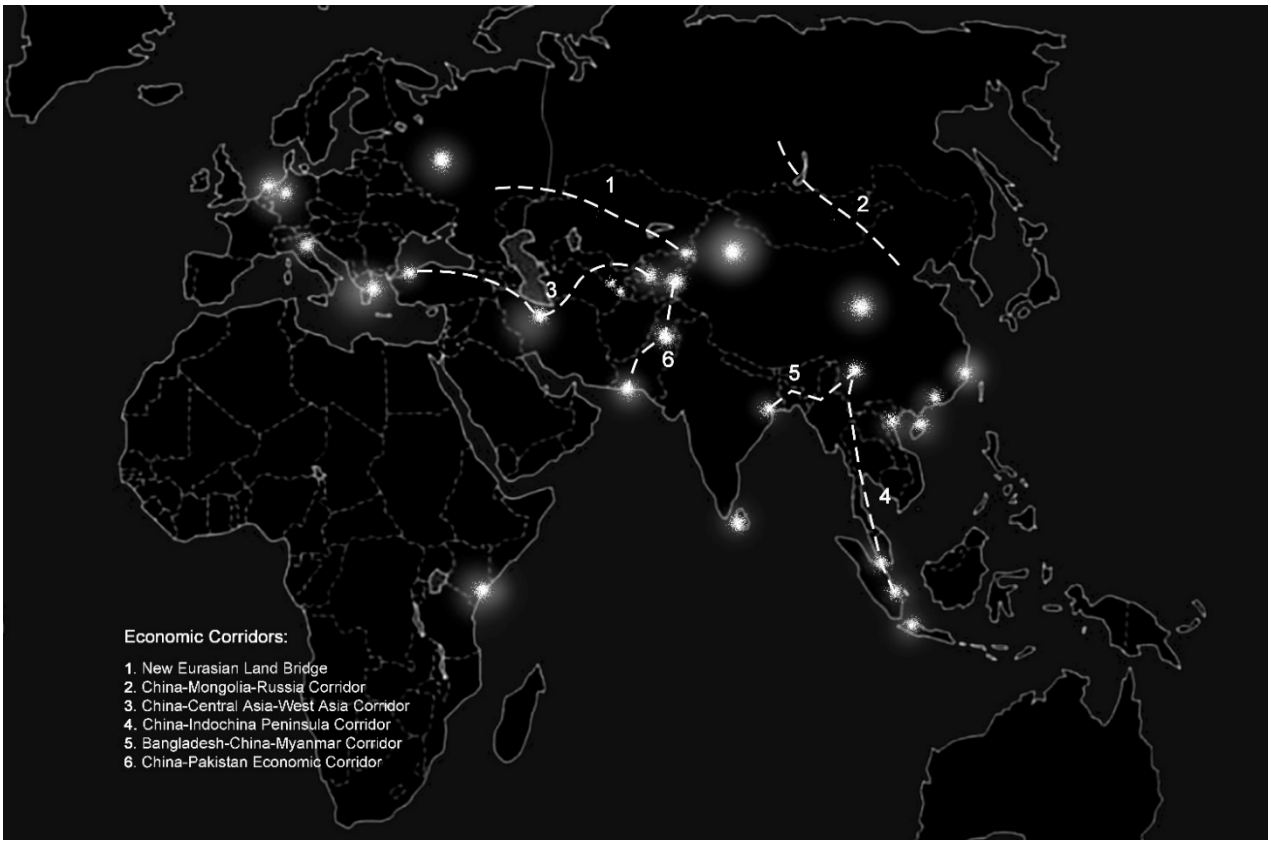

Figure 3: Six Economic Corridors of BRI, (drawn by author), Data source: https://merics.org/en/tracker/mapping-belt-and-road-initiative-where-we-stand

1.2 Difficulties and Challenges

Although president Xi Jinping in May 2017 was held in Beijing the two-day summit, invited world

leaders, government officials, investors and delegations to participate and work together to "build peace, tolerance and free trade road," and he "Call for abandoning the old model based on competition and diplomatic power games". (Goh and Chen 2017) Despite this, all publicity for the initiative has been carried out through forums, summits, news, official media, high-profile official visits, commissions, publicity, advertising and investment, but the development and realization of the “Belt and Road” initiative still faces Many challenges, that is, in addition to the risks involved in its success, from economic and ecological issues to geopolitical factors, due to the complex relationship between China and its neighbors due to "history, religion, border delimitation, and natural resources", there are still misunderstandings about China. risk. Exist, plans, influence and "geopolitical rule grand strategy". (Wang 2016)

1.2.1 International opposition

Although the economic benefits of cooperation with China are obvious, but cause international relations, mainly in the global economy and trade, the US-led non-participating countries as China could bring influence and critical of the project, which is the main challenge the initiative facing.

From the reports of the American government, they see the Belt and Road policy as a very ambitious policy by the Chinese government to significantly increase China's international influence. Some scholars believe it will increase Beijing's dominance of the world's political, economic, and military orders, and that it will be an important step toward Chinese world domination. Some scholars believe that the Belt and Road route, which runs directly through India's disputed Kashmir region with Pakistan, would impede India's sovereign integrity, which is one of the main reasons why they believe India is opposed to the Belt and Road policy. Japan, which has always been in dispute with China over territorial waters, from the reports of the Japanese government, has also clearly expressed its dissatisfaction with Beijing's growing, unchecked military hegemony. The U.S. response, Japan and Australia formed a counter-initiative in 2019, the Blue Dot Network. Australia, for its part, announced through Foreign Minister Marise Payne on April 21, 2021, that it would withdraw entirely from the Belt and Road Initiative.

1.2.2 Negative Impact of BRI Development on the Environment

In addition to the controversy surrounding the demise of China’s iconic “Belt and Road” initiative, many people in the field of international shipping and logistics also claim that “climate change / global warming” will change the shape of the “Belt and Road” initiative, based on the scope of claims. From melting the permafrost to slowing down the steam time as the ship slows down to reduce its carbon dioxide footprint. There has been a lot of discussion about the cost of complying with the IPCC report and the global emissions regulations that will take effect in 2020. These discussions show that a mentality of “collective thinking” has replaced rational debate because it involves a constantly changing geopolitical environment. Another way to express it is to say that emotions are driving the discussion, rather than the substance of the claim.

In simple terms, the Emissions Control Areas through MARPOL regulations coming into effect will do more to reduce pollution levels than affect climate, and will impact significantly on ocean steam

times and cost. This measure plays into the hands of China's strategy to move more cargo / freight from sea to the lower emitting rail network – nothing changes in terms of the Belt & Road Initiative plan as a result, while illustrating how well thought out it is. Current plans by China call for growing rail freight by 1.1 billion tons, ocean going freight by 550 million tons and to reduce road transport as a result by 400 million tons by 2020, as facilitated by the Belt & Road Initiative. In other words, China's Belt & Road global transport plans are following proven science.
In conclusion, no matter how many wind or solar farms that are built, whilst improving air quality and reducing pollution, they will not affect the climate so as to alter the way the Belt & Road Initiative develops. Natural weather events will continue to happen and users of the infrastructure will have to maintain the traditional practice of contingency and emergency planning.

1.2.3 The outbreak of the COVID-19 pandemic

In 2020, the COVID-19 pandemic broke out in the whole world. Increasing uncertainties in the global economy, coupled with the impact of the global spread of "new crown pneumonia", is increasing downward pressure on the economy, which has brought some challenges to China's economic development and foreign exchanges, and has had a serious impact on the high-quality promotion of the "Belt and Road". The "World Factory" shut down unexpectedly, and the effects of delays in resumption of work, supply shortages, and deceleration of circulation in manufacturing industries such as electronic information, communication equipment, automobiles, and steel are gradually appearing, and the chain reaction is quickly transmitted to the global industrial chain.

In the face of the sudden outbreak of the covid-19 epidemic, China has been watching and helping each other to overcome the difficulties. Amidst such difficulties, it has proposed to strengthen the construction of a healthy Silk Road, a green Silk Road, and a digital Silk Road, and persist in promoting it. The joint construction of the "Belt and Road" continues to move forward, conveying confidence and strength to the international community, and has a positive impact on global anti-epidemic cooperation and economic recovery.

1.3 BRI Goals and Development

1.3.1 The Status Quo of World Development

Since domestic stability is China's main goal, "China's biggest challenge is the structural reform of the economic model from investment and export to domestic consumption". Therefore, in order to upgrade the industry, learn and improve high-tech and management experience, and reform the domestic economy, China the joint national forces to implement this initiative, centralized political government and private resources for long-term benefits, it is worth it. In general, the "Belt and Road" initiative has been explained in different ways, revealing the openness and continuous development of the project and its multiple goals at the domestic and international levels.

Since that, the most significant problem for China now is the overcapacity and the shortage of oil and natural gas energy that is inconsistent with its excessive productivity.

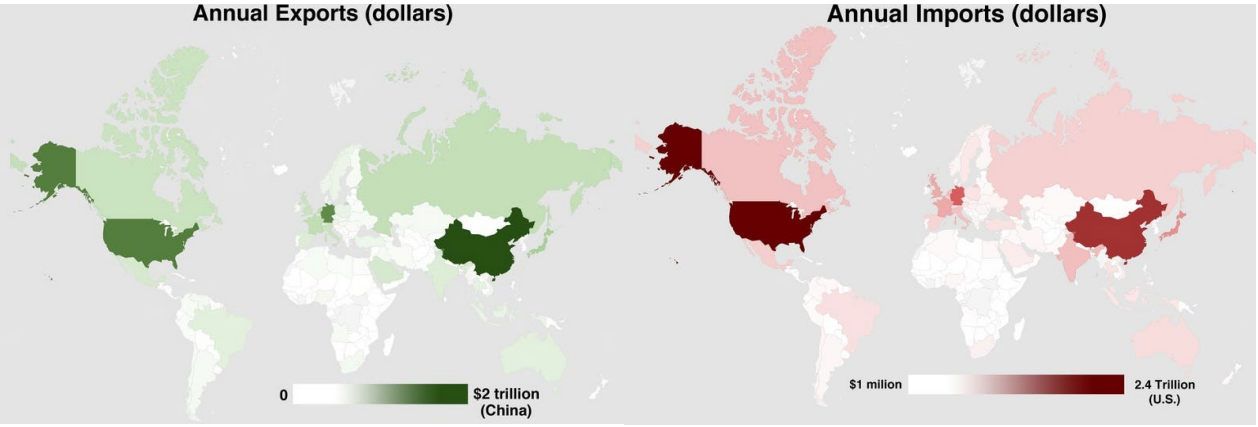

Figure 4: Global Annual Import and Export Volume (2013), Source: https://www.businessinsider.com/the-global-economy-explained-in-17-maps-2013-9?r=US&IR=T#heres-who-is-selling-12

From the figure 3, we can conclude that as of 2013, China is one of the world's largest exporters and importers, and its export volume can reach 2 trillion US dollars a year. However, in general, the import volume is lower than the export volume. By 2019, China's export volume ($2.57 trillion) is nearly 1 trillion more than the import volume ($1.58 trillion). It can also be seen that China's current overall It is in a situation of relatively overcapacity. Therefore, international trade business is now the most important and effective way for China's economic development. Trade can realize the excess production capacity in the international market. This is also the core interest of China's launch of BRI.

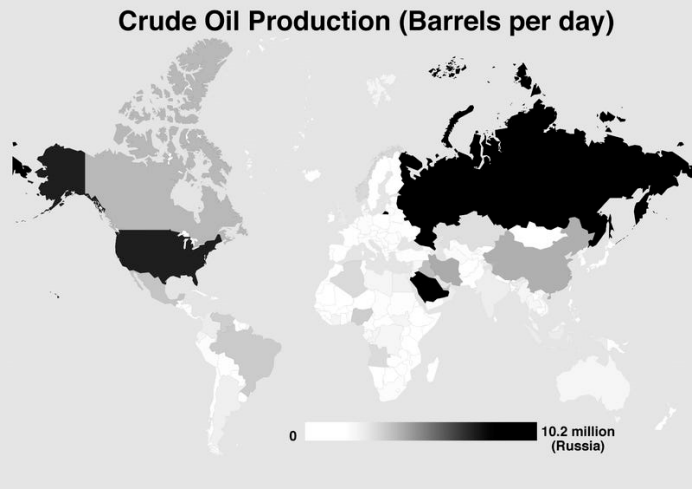

Figure 5: Global Daily Oil Production (2013), Source: https://www.businessinsider.com/the-global-economy-explained-in-17-maps-2013-9?r=US&IR=T#heres-who-is-selling-12

From figure 4, oil and natural gas production capacity seems to be another picture. Although China has a vast territory, its underground oil resources and reserves are relatively lacking, and there is still a large amount of oil production in Russia, Saudi Arabia and the United States. gap. Coupled with China's large population, it is far from enough to rely on its own reserves. Therefore, oil and natural gas resources have actually been very dependent on imports for many years. This is also one of the most important development roles of the Arctic Silk Road in the BRI for China. Therefore, there are many energy transmissions related projects in the BRI projects in Russia and the Middle East and West Asia.

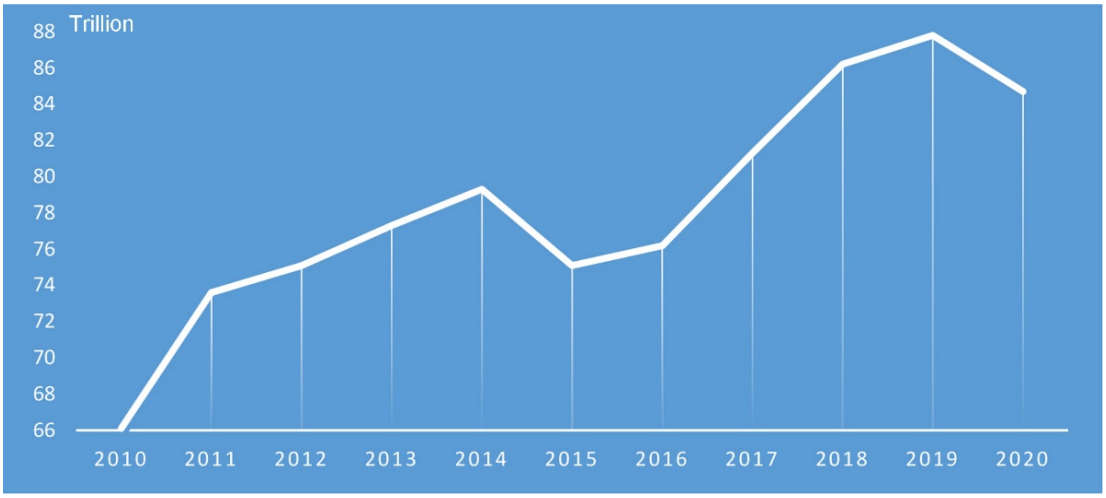

Figure 6: Annual GDP of World from 2010 to 2020, (drawn by author), Data source: https://data.worldbank.org/

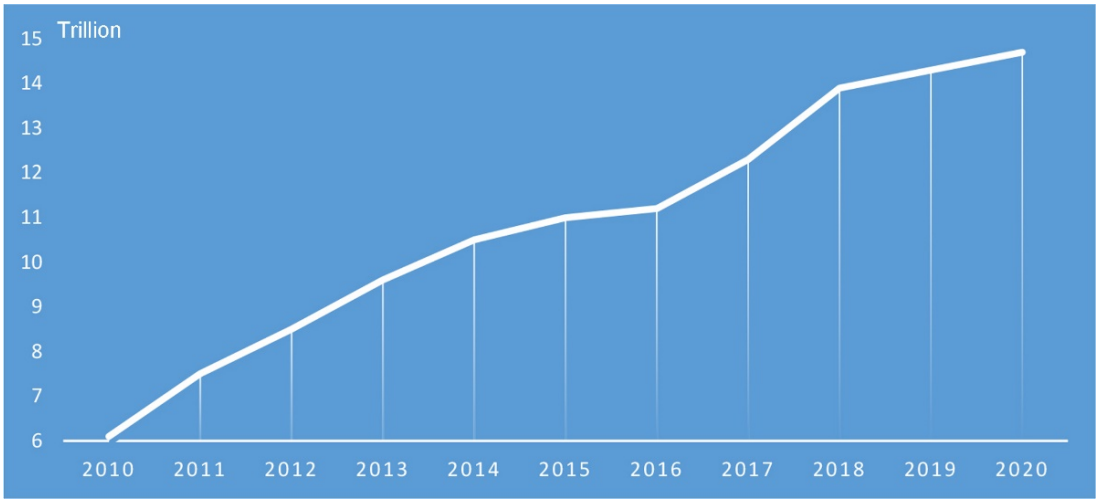

Figure 7: Annual GDP of China from 2010 to 2020, (drawn by author), Data source: https://data.worldbank.org/

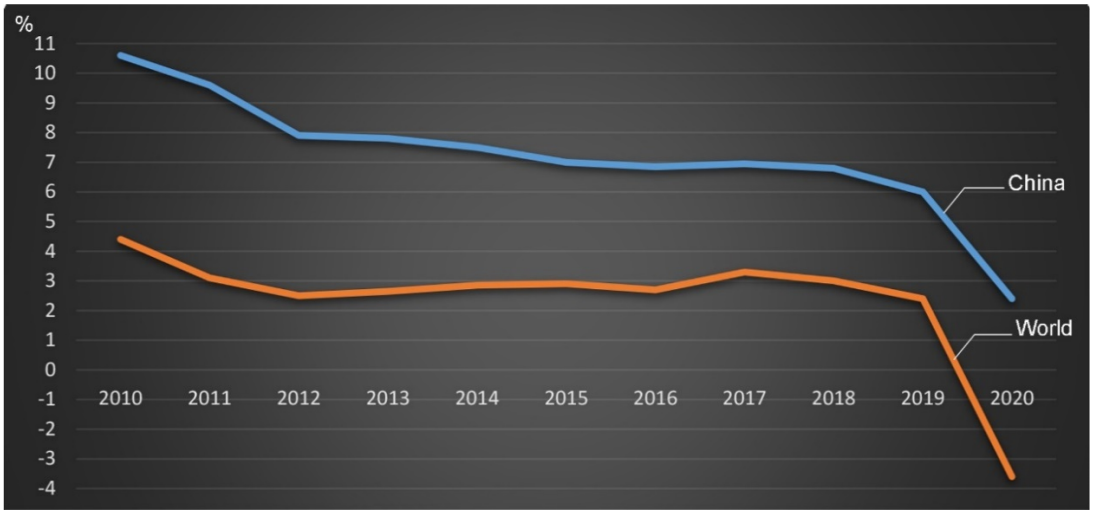

Figure 8: Annual GDP Growth Rate of World & China from 2010 to 2020, (drawn by author),Data source: https://data.worldbank.org/

From the sets of data in the figure 5-7, we can see that China's annual GDP has been more stable than

the growth of world GDP in the past ten years, and it has been in a state of growth, while the world GDP has been in a period of decline. Through the growth rate of GDP, we can clearly see the advantages of China's economy relative to the overall economic trend of the world in the past 10 years. Especially after 2019, the world GDP growth rate plummeted to close to -4%, showing a serious negative growth. Although China's GDP growth rate in 2020 has declined compared to 19 years, it is still positive. This also shows that despite the impact of the global epidemic, China's economic market is still more stable relative to the world. Therefore, from a macro perspective, in most cases, co-investing with the Chinese government or enterprises may still be a less risky option in such a large environment full of turbulence and crisis. The following data on the rate of return and risk of investing in national bonds can also prove this point.

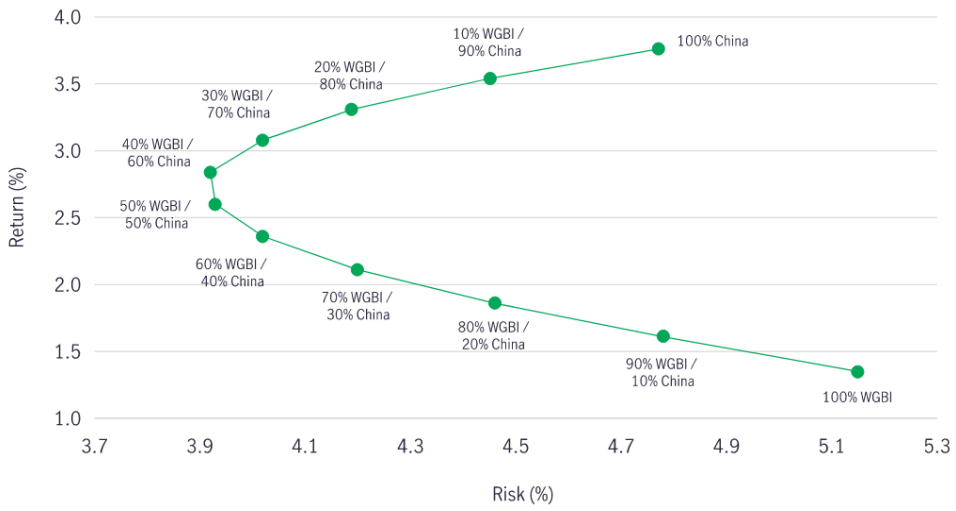

Figure 9: Annul Risk / Return Profile for a Hypothetical Portfolio (January 2013-May 2021), Source: https://www.manulifeim.com/

This largely confirms that combining China bonds with global government bonds can enhance returns and reduce overall risk.

As of 2021, since the birth of BRI has passed 8 years, its sphere of friends expanded to 140 countries and 32 international organizations, "along the way" from ideas into practice, countries in the world Brings opportunities and dividends. The World Bank report believes that the full implementation of the "Belt and Road" initiative will increase global trade volume and global revenue by 6.2% and 2.9%, respectively. Facts have shown that the “Belt and Road Initiative” has become the world’s widest and largest international cooperation platform.

1.3.2 Main Investment Direction of BRI

The BRI is a “transportation corridor” invested in communication links and infrastructure projects to “improve the “interoperability” of the Asia-Europe Internet. Railways, ports, pipelines, maritime routes and airports, “promoting trade, Tourism and the exchange of goods "and services". (Fallon 2015) (Bhoothalingam 2017) President Xi proposed that in order to "establish closer economic ties in the Eurasian region, deepen cooperation, and expand development space", countries along the route "should innovate ideas and jointly build the 'Silk Road Economic Belt'". He believes that the initiative

should focus on the current five main goals: strengthening policy communication; improving road connectivity; and promoting the construction of the “Belt and Road”. Trade is smooth; currency in circulation is strengthened; and understanding between people is promoted. (Bhoothalingam 2017)

The initial focus of the “Belt and Road” initiative was infrastructure investment: education, building materials, railways and highways, automobiles, real estate, power grids, and steel. Examples of infrastructure investment include, but are not limited to, ports, skyscrapers, railways, highways, airports, dams, and railway tunnels. This shows the strategic importance of transportation and trade logistics in the entire "Belt and Road" diplomatic policy.

According to the MERICS BRI database, since the project was launched, China has invested more than US$100 billion in BRI-related infrastructure projects. Excluding projects that are still under construction or in the planning stage, these projects involve greater investment. The picture below shows the railway, pipeline and port projects. Projects in these areas usually receive the highest media attention, but do not necessarily involve the largest investment.

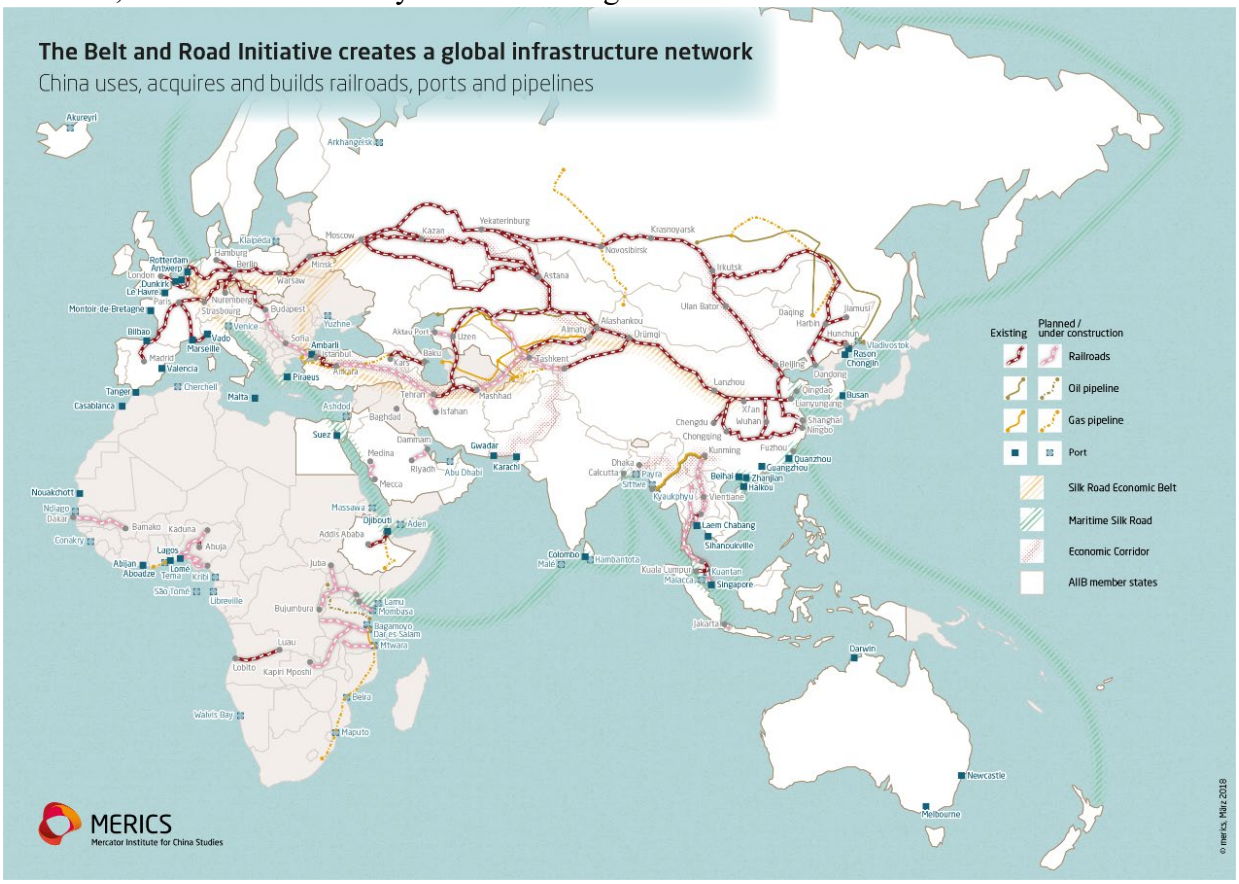

Figure 10: Railway, Pipeline and Port Projects in BRI (2021), Source: https://merics.org/en/tracker/mapping-belt-and-road-initiative-where-we-stand

1.3.3 Five Architectural Typologies to Focus on

Different functional types of buildings have their characteristics and contribute to the development of the Belt and Road in different directions. According to the content proposed by the Chinese government in the 13th Five-Year Plan (Page 16-17) mentioned above, and then combined these two

characteristics of buildings, the Belt and Road-related architectures are divided into the following five families. In the Made in BRI research, the types of projects we have focused on in the BRI project are the following five families: Super Gathering Places, Gift Architectures, Mass Housing Enclaves, Spaces of Free Exchange, Manufacturing Worlds.

Under each type, we find some representative project cases:

Super Gathering Places: Meeting in between architectures.

This family groups together a multitude of different spaces conceived for hosting meetings, exhibitions, and trades. Being the BRI primarily a strategy of relations, discourses, and diplomacy, these buildings are fundamental drivers of business opportunities and exchanges that arise on the ground and for this reason, they generate, through structural innovations and spatial grandeur, the spaces these require.

Gift Architectures: Hybridizing Extra-state Architectures.

The BRI is mainly narrated as an infrastructure for business growth. However, many other urban materials arise when business activities touch the ground and meet local communities. Leisure, commercial, medical spaces are usual indirect interventions in the geographies of the BRI, which through their eccentric, hybridize, mediatic architectural language aims at distracting both the local inhabitants and the global audience from the program's political, financial and social controversial issues. Many times, donated by a state to another, these building features a hybridization of local and global, distant and near, architectural languages that reveals the transnational complexity of the BRI as geopolitical issue.

Mass Housing Enclaves: Living between standard forms and local conditions.

Featuring strongly variegated and sometimes extreme territories, which range from deserts to artificial islands, housing the geographies of the BRI is not always an easy task. However, most of the living spaces it provides are mass produced housing that rarely differs from one place to another in terms of forms, program and constructions techniques. However, their architectural features are important properly for this reason. They reveal the essence of a suburbanizing world, in which mass-produced mid to high rise buildings represent both the living solution for a larger part of the world urban population as well as how many others dream of living.

Spaces of Free Exchange: Architectures between humans and data-driven machines.

This family gives us the opportunity to treat automation as an architectural issue, or at least as a spatial one. Featuring the most innovative and surprising logistic system, free trade zones, logistic hubs, transform the ground of the BRI in a machinic landscape, in which flows of people and goods contribute to shaping the built environment, proliferating typological inventions and generating dispositional modes of practice that see the political problems of logistics as fundamentally architectural.

Manufacturing Worlds: Unveiling the contemporary production.

When the production reaches the most remote space in the world, it cannot stay alone anymore, and this appears very clearly in the geographies of the BRI. In many of its high intensity productive spaces, comprehending industrial parks, business parks, extractive grounds, special zones, among the many definition, manufacturing buildings establish spatial relations with a whole series of facilities that are

fundamental to support the modern production. Such intertwined relations between production, logistic, research and entertainment generate hybrid architectural typologies and complex structure of new urban areas that unveil the contemporary industrial enclave not only as a functional place but also as an infrastructural space generated though protocols and standards.

	FAMILY	PROJECT	LOCATION	CITY	YEAR OF CONSTRUCTION	DESIGNERS (If applicable)	SCALE	FUNCTION
	Manufacturing Worlds							
1		Suzhou Industrial Park	China（Jiangsu province）	Suzhou	2012-2016	FTA	428,400 ㎡	Industrial Park
2		Map Ta Phut Industrial Estate	Thailand (Rayong province)	Map Ta Phut	1990-2005	-	1.5 sq.km Urban scale	Industrial Park
3		Great Stone Industrial Park	Belarus	Minsk	2015 - in progress	-	112 sq.km	Industrial Park
4		Kunming International Health Industrial Park	China(Yunnan province)	Kunming	2019 - in progress	-	Urban scale	Industrial Park
5		Long Jiang Industrial Park	Vietnam	Tien Giang	2007	-		Industrial Park
	Mass Housing Enclaves							
6		Zhongjian Building, Lanzhou New District	China(Zhejiang province)	Lanzhou	2019	-	22916.68㎡	Residential
7		Hualing Tbilisi Sea New City	Georgia	Tbilisi	2015 - in process	Hualing Group	2 million sq.m	Residential
8		Kilamba city	Angola	Kilamba	-	-		Residential
	Super Gathering Places							
9		Xi 'an Silk Road International Conference Center	China（Shanxi province）	Xi'an	2020	GMP & TJAD	306700㎡	Convention & Exhibition
10		Xi 'an Silk Road International Exhibition Center	China（Shanxi province）	Xi'an	2020	GMP & TJAD	72000㎡	Convention & Exhibition
11		Lianyungang Industrial Exhibition Center	China（Jiangsu province）	Lianyungang	2017	GMP	77418㎡	Convention & Exhibition
12		Beijing Yanqi Lake International Conference	China	Beijing	2014	AECOM	180000㎡	Convention & Exhibition
13		Beijing Yanqi Hotel	China	Beijing	2014	AECOM	180000㎡	Hotel
	Gift Architectures							
14		General Hospital of Niger	Niger	Niamey	2016	CADI	34,000 ㎡	Hospital
15		Abu Dhabi International Airport	Abu Dhabi	Abu Dhabi	2019	KPF	700,000㎡	Airport
16		Lanzhou amusement park	China(Gansu province)	Lanzhou new area	2015 - in progress	-	Urban scale	Airport
17		Gwadar Port	Pakistan	Gwadar	2007 - in progess	-	-	Port
	Space of Free Exchange							
18		Khorgos Gateway Dry Port	Kazakhstan	Khorgos	2013 - in progress		Territorial Area	Special Zone
19		Melaka Gateway Port	Malaysia	Malacca				Port
20		Colombo City Port & Colombo International Container Terminal	Sri Lanka	Colombo	2008 - in progress	SWECO	Urban scale	City & Port
21		Lianglu-Cuntan Free Trade Port Area	China	Chongqing	2007- in progress		Urban scale	FTZ
22		Djibouti international free trade zone	Djibouti	Djibouti	2017	DPFZA	48,000,000 m²	FTZ & Port
23		Gwadar Free Zone	Pakistan	Gwadar				FTZ
24		Piraeus Port	Greece	Athens	2008		39,000,000 m²	Port

Figure 11: Cases List of 5 Families related to BRI (drawn by author)

1.4 BRI Development Around the world (Related to case study)

Eastern Europe and Central Asia

Central Asian countries such as Russia and Pakistan have actively responded to and supported China's "One Belt One Road" initiative and accelerated the construction of projects worldwide.
Russia is an early partner of China. At present, Russia and China share 150 joint projects such as the natural gas pipeline and the Polar Silk Road. In March 2015, Russia's First Deputy Prime Minister Igor Shuvalov affirmed that "Russia should not regard the Silk Road Economic Belt as a threat to its traditional regional influence, but as the Eurasian economy. Opportunities for alliances".

Southeast Asia (Mainly Sri Lanka)

Sri Lanka is located in the Indian Ocean and is close to the main Eurasian international freight routes. Because of its unique geographical location, it has natural advantages in terms of transshipment, transit and replenishment. As the function of the Indian Ocean trade channel has received more and more attention, the strategic role of Sri Lanka has also attracted much attention. Compared with other countries in South Asia, Sri Lanka is superior in terms of traffic conditions, population quality, legal system, and business environment, and has developed into one of the most attractive investment destinations in the Asia-Pacific region.

On September 17, 2014, under the witness of President Xi Jinping and the then President of Sri Lanka Rajapaksa, the Colombo Port City project started smoothly. The two heads of state (the then president and current prime minister of Sri Lanka) personally cut the ribbon for the unveiling of the project. Since the implementation of the project, it has been valued by successive leaders of China and Sri Lanka. Wu Bangguo, chairman of the Standing Committee of the Chinese National People's Congress, and Yu Zhengsheng, chairman of the National Committee of the Chinese People's Political Consultative Conference, was held on September 16, 2012 and April 7, 2017 respectively. Japan inspected the Port City project and gave positive guidance. Slovakian presidents, prime ministers and other high-level officials have visited the project many times. In the third chapter of the paper, the case of Colombo Port City will be studied in detail.

Africa (Mainly Djibouti)

The field of infrastructure construction in China-Africa cooperation is a topic frequently reported by the African media. Specifically include "infrastructure construction", "harbour construction", "African development", "financial assistance", "energy cooperation", "equal respect", etc.; specific projects include highway projects (such as Entebbe Express), high-speed rail projects (Such as the Asia-Djibouti Railway), power plants (such as Uganda Simba Hydropower Station), energy pipeline construction, communication network construction, seaport construction, airport construction, etc.; high-frequency vocabulary in media reports includes "upgrade", "transportation facilities", "Connection", "Opportunity", "China Aid", "Win-Win Cooperation", etc.

The city state of Djibouti is one of the principal East African beneficiaries of the Belt and Road

Initiative. Located on the Bab el-Mandeb strait – the strategically vital entrance to the Red Sea, where ships travelling from East Asia can quickly proceed through the Suez Canal, over the Mediterranean and onto the Atlantic Ocean – it also has the advantage of providing the main channel through which neighbour (landlocked) Ethiopia trades with the world.

Eastern Europe (Mainly Greece)

14 Eastern European countries such as Greece and Croatia have also cooperated with China under the framework of the “Belt and Road” initiative.

Greece is called a European country by the Chinese media as a model for building the "Belt and Road" with China. Greece has an advantageous geographical location and can play a pivotal role in connecting Asia and Europe. China supports the "Belt and Road" initiative to connect with Greece's development strategy, strengthen cooperation in the fields of finance, technology, and digital economy, and is willing to expand imports of high-quality agricultural products from Greece. "We have always wanted to get out of the economic crisis and improve people's lives. The goals pursued by the 'Belt and Road' are consistent with those pursued by Greece." In April 2019, Greek Prime Minister Tsipras attended the second "Belt and Road" international cooperation summit. The forum’s high-level meeting also delivered a speech: “I would like to leverage Greece’s geographical advantages to jointly build the Belt and Road Initiative and China-CEEC cooperation platform, develop strategic relations with China, and support the deepening of cooperation between Europe and China. Greece believes that China will not Will use power to conquer the world, but use wisdom to contribute to mankind." In terms of construction projects, the Greek seaport invested by China has become a global shipping gateway. In the third chapter of the paper, the case of Piraeus, the largest port in Greece, will be studied in detail.

Italy (Mainly Venice)

In March 2019, Italy became the first G7 member country to join the “Belt and Road” initiative. The new partner has signed a memorandum of understanding worth 2.5 billion euros, covering transportation, logistics, port infrastructure and other fields.

To a certain extent, Italy is the birth place of the entire Western civilization. Among European countries, only Italian culture is a modern civilization that began with the integration of ancient Greco-Roman civilization, medieval Christian civilization and the Renaissance.
Both China and Italy are ancient civilizations with a long history and a long history of cultural exchanges. During the Song and Yuan dynasties, with the arrival of Italian businessmen such as Marco Polo in China, the scale of cultural exchanges between the two countries gradually expanded and their understanding gradually deepened. "Marco Polo's Travels" is the first travel book written by a European that describes Chinese history, culture and art in detail, and is a milestone in the cultural exchange between China and the Western world.

The transition between China and Italy started on the ancient Silk Road. The “Belt and Road” initiative has become a new opportunity for Sino-Italian exchanges in the new era. The two ancient civilizations

have once again merged and renewed their former glory. Italy actively participates in the "One Belt One Road" initiative and has now become one of the major overseas investment countries of Chinese companies. Italian media have praised the “Belt and Road Initiative” for conforming to the trend of the times, and it is also a historical opportunity that Italy should seize, because it actively shares the achievements of China's development and eases the domestic economic recession. The “Belt and Road” initiative has received active participation and extensive support from the Italian government and all walks of life because of its compatibility with Italy’s own development needs. It has also created conditions for China and Italy to achieve greater scope, higher level and deeper cooperation, and for China and Italy. The development of cultural exchanges and relations between the two countries has created unprecedented historical opportunities.
The cases selected in Chapter 3 of the paper have to a certain extent affected the selection of BRI-related countries described above.

China-Italy Cooperation

In the past, most of the cooperation and exchanges between Italy and China focused on the fields of culture and education. Since China and Italy established a comprehensive strategic partnership in 2004, the Italian government issued policies to encourage universities and high schools to teach Chinese. China and Italy launched the "Marco Polo Project" (2005), opened the first Confucius Institute in Rome (2006), and the two governments launched the "Turandot Project" (2009). At present, the Italian Ministry of Education, University and Research has established the "Italian Chinese Language Teaching Syllabus Working Group" with the aim of formulating unified standards. (Sun and Bai September 1, 2019)

Before Italy signed a document to join the “Belt and Road” initiative in 2019, the cooperation and exchanges between Italy and China have increased a lot through the Belt and Road cooperation initiative. In December 2015, Paolo Costa, Chairman of the Venetian Port Authority and his party visited Shanghai and Ningbo, China. He introduced at the "21st Century Maritime Silk Road" Advanced Maritime Forum that the Port of Venice is building the "Offshore Land Multiport Port System" (VOMOPS) project, hoping that this project can solve the difficulty of super large container ships to reach Venice. The port’s predicament is to reactivate the Port of Venice through the “One Belt, One Road” strategy. (Eworldship 2015)

In an exclusive interview with a reporter from China Business News, Costa emphasized that construction of this concept is scheduled to begin in 2016 and will be completed in 2023. “I hope this concept can enhance the overall throughput capacity of ports in this sea area and promote trade development. Costa said, "This is a mixed investment. We need infrastructure companies and logistics operation centers. Therefore, China and Italy have a lot of room for cooperation in this area." Later, the "Joint Communiqué" commented that China and Italy recognized the "Belt and Road Initiative". The initiative has great potential in promoting interconnectivity, and is willing to strengthen the docking between the “Belt and Road” initiative and the Pan-European Transportation Network (TEN-T), and deepen cooperation in the fields of ports, logistics and shipping. (Eworldship 2015)

Chapter 2. Ports and Sustainability

2.1 Why Spaces of Free Exchange

Spaces of Free Exchange / Free trade zone (FTZ) is an architectural typology most related to the core economic interests of those families supported by BRI. The Belt and Road Initiative involves many countries and regions all over the world and aims to boost their economies and create development opportunities for local businesses and people. In the process, many buildings and facilities are being built as needed. These include investment in infrastructures such as roads, bridges, railways, and transport hubs; new construction parks such as industrial parks and logistics parks in response to expanding demand.

Therefore, in the face of the development of the Belt and Road, China and abroad have also increased their efforts to invest in the construction of large port buildings and airports, the development of the exhibition industry to attract and expand investment, and the optimization and construction of logistics parks and industrial parks.

Not only from the perspective of the ancient Silk Road or the new Silk Road in the 21st century, its main role is the transportation of commodities and people. Whether it is material or cultural commodities, the most needed construction projects must be related to transportation and logistics systems. In other words, the related infrastructure of transportation routes is the basis for responding to the "Belt and Road" initiative and achieving a win-win situation between China and other countries. From some perspectives, the routes of the “Belt and Road” are actually logistics routes and strategic networks. From the goals and existing actions of the “Belt and Road” mentioned in Chapter One, the types of construction projects, and the cooperative relationship between China and different countries and regions, it can also be seen that commercial logistics projects are in relatively developed investment countries. Such as European countries, one of the most important investment and construction directions is free trade zone. And China has built or expanded many free trade ports, international logistics parks, and related transportation hubs in cities around the world, including Chinese cities, which will lay the foundation for more in-depth cooperation among countries in the future. The difference between the new Belt and Road Initiative and the ancient Silk Road is that today's international trade logistics has a modern freight flow and logistics management system, as well as a diverse and complex transportation network.

From the heritage-rich Port of Rotterdam to the large terminals at the inland port of Duisburg, logistics hubs across Europe are busy upgrading facilities to attract more business through the surge in trade driven by the BRI interconnectivity. Ivona Ladjevac, head of the Belt and Road Initiative Regional Center of the Belgrade Institute of International Politics and Economics, said that the “Belt and Road” initiative provides a valuable opportunity to strengthen internal ties between European countries. "BRI infrastructure projects can bring southern European countries closer to the north, reduce transportation costs and increase the flow of people and goods," Rajvac said. The Dutch financial company ING estimates that a 50% reduction in trade costs between countries along the “Belt and Road” could increase world trade by 12%.

2.1.1 International Trade Logistics

Broadly speaking, international logistics research includes international trade logistics, non-trade logistics, international logistics investment, international logistics cooperation, international logistics exchanges and other fields. In a narrow sense, International Logistics (IL) mainly refers to: when production and consumption are carried out independently in two or more countries (or regions), in order to overcome the spatial and temporal distance between production and consumption, An international commodity or exchange activity that logistically moves goods (commodities) to complete the ultimate goal of international commodity transactions, that is, to realize the seller's delivery of documents, goods, and payment for the goods, while the buyer accepts the documents, pays for the goods, and collects the goods Conditions of trade convection.

In order to adapt to the rapid expansion of international trade, many developed countries are committed to the construction of ports, airports, railways, highways, and three-dimensional warehouses. Some international logistics parks have also emerged as a result. These parks generally choose to be built near large ports and airports, relying on important ports and airports to form a logistics center for handling international trade, and provide more logistics services in accordance with the development and requirements of international trade. These international logistics centers generally have the function of a free-tax area.

A very important feature of international logistics is the difference in the logistics environment. Different countries have different laws that are compatible with logistics, which increases the complexity of international logistics; the different levels of economic development of science and technology in different countries make international logistics under the support of different technological conditions, even because some regions simply cannot The application of certain technologies has led to a decline in the operation level of the entire international logistics system; the different standards of different countries will make it difficult for the international logistics system to establish a unified standard; the national conditions of different countries will inevitably cause great limitations on international logistics.
To make things flow internationally, it is very important to unify standards. At present, the United States and Europe have basically achieved unified standards for logistics tools and facilities, such as the use of 1000×1200 mm for pallets, several unified specifications for containers and barcode technology, etc., which can greatly reduce logistics costs and the difficulty of transshipment. Countries that do not move closer to this standard will inevitably spend more time and expense in many aspects such as transshipment and replacement of vehicle bottoms, thereby reducing their international competitiveness.

In terms of logistics information transmission technology, European countries not only realize the standardization within enterprises, but also realize the standardization between enterprises and the European unified market. This makes the system between European countries easier and more convenient than the exchanges with Asian, African and other countries. efficient.

In the 1960s, a large number of international logistics began to form, and large-scale logistics tools appeared in logistics technology, such as 200,000 tons of oil tankers and 100,000 tons of ore ships.

2.1.2 How Free Exchange Space Work

The World Bank defines FTZ as "in duty-free areas, offering warehousing, storage, and distribution facilities for trade, transshipment, and re-export operations". (Akinci and Crittle 2008) It is an area where goods may be imported, stored, handled, manufactured, or reconfigured and re-exported under specific customs regulation and generally not subject to customs duty. Free trade zones are generally organized around major seaports, international airports, and national frontiers—areas with many geographic advantages for trade. (Encyclopaedia 2021)
Free-Trade Zone (FTZ) also called ‘Foreign-Trade Zone’, is a designated area that is considered outside customs territory. In an FTZ, domestic and foreign goods can be moved, handled and assembled without paying the duties and taxes normally required by customs and border protection.

Corporations setting up in a zone may be given a number of regulatory and fiscal incentives, such as the right to establish a business, the right to import parts and equipment without duty, the right to keep and use foreign exchange earnings, and sometimes income or property tax breaks. There may also be other incentives relating the methods of customs control and filing requirements. The rationale is that the zones will attract investment, create employment, and thus reduce poverty and unemployment, stimulating the area's economy. These zones are often used by multinational corporations to set up factories to produce goods. A FTZ offers a unique opportunity to defer, reduce or eliminate customs duties on the products, which can result in significant cost savings.

2.2 The Container Terminal

In the development and operation of FTZ, the most significant negative impact on the ecological environment is the work and operation of the container terminal. Therefore, we will emphasize the role and design of the container terminal below.
Container terminals or container ports are the terms designated for the intermediate destination facilities that enable shipping containers to switch methods of transport route to their final destination. Often times, cargo arrives to a container terminal in a single ship and is distributed over several modes of transportation for delivery to inland customers. The terminal is also an area which is designated for the maintenance and temporary stowage of shipping containers. Sometimes, the unloading, loading and storage of the cargo within these containers is also carried out here.

2.2.1 Container Terminal’s Role in the Shipping Process

Container terminals are located strategically as critical points of a complex logistic network. Maritime terminals host the transfer of containers from ocean vessels to road and rail vehicles and canal barges, and the other way around. They are often a part of a larger port- the largest of which are located around major harbors. When the transloading is between rail and road, the facility is referred to as an inland container terminal. These are situated in or nearby major cities and are well-connected to maritime containers by rail.

Hinterland connections to maritime terminals are vital to the supply chain. Consider the many landlocked countries in Europe and their inability to trade goods with non-neighboring countries

should this interconnectivity fail to exist. The European Sea Ports Organization, which represents all ports within the European Union has stated that “it is essential to build a sustainable pan-European transport network connecting all relevant ports with main inland nodes.” As many European countries don’t have any seaports, their economic welfare relies heavily on having land connections to seaports in other countries.

2.2.2 Operational Process of a Container Terminal

After the ship arrived at the port, a dock crane was used to remove the container from the ship. The quay crane transfers the container from the cabin and deck to the vehicle, such as an Automatic Guided Vehicle (AGV). The vehicle travels between the ship and the stack, where the container is put down and stored for a short period of time. After that, the containers are taken out of the stack by cranes and transported by AGV to the next mode of transportation. For example, these might be barges, deep-sea ships, trucks, or trains.

To load the export container onto the ship, these processes are performed in reverse order. Most terminals still use manned equipment such as straddle carriers, cranes, and multi-trailer systems, despite the exciting advances in container terminal automation.

2.2.3 Container Terminals Classification

According to their ownership between ports, operators, shipping lines and carriers, the container terminals around the world are classified into five main types:

State-run terminals
All the facilities of the public terminals, for instance, loading and unloading processes, tariff rates and allotted places in and out are shared equally among all the shipping lines and operate on a first come first serve basis. Regular tariff rates apply for the handling of containers and other related charges or are otherwise or discounted upon agreed rates.

Carrier-Lease dedicated terminals
These are the result of collaboration between major carriers and port authorities resulting in the signing of long-term lease agreements for exclusive use by these carriers. The carriers are responsible for paying costs which are incurred as priority usages for the carriers. Maersk, as one example, has quite a few terminals contracted for their long-term usage. Furthermore, a few shipping lines have developed partnerships which use multi-user long-term contracts to share out the terminal usages.

Terminals built and operation terminals
Terminal operators are the direct investors in the construction, operation, handling facilities of a terminal. Contracts for lease with the port authorities are made with a deposit towards the total handling charges of the container operations.
This is a type of licensing in which a carrier or several carriers together lease the container terminals by making advanced payments to the port authorities or investing directly in their construction, operation and handling services, similar to terminals built and operation terminals.

Joint venturing of the carriers and terminal operators
Shipping lines and the terminal operators establish a company so that the terminals are jointly operated for safe, prioritized and efficient container handling operations.

2.2.4 Challenges in the future

Ports are important factors in economic development, especially if we consider how much we rely on ships, and therefore ports, to obtain any kind of cargo. Therefore, international logistics and international ports are the core construction projects in BRI, but it is precisely because of this that BRI has received international doubts about whether it can achieve environmental sustainability. Large international shipping will have a serious impact on the environmental climate, especially the marine ecological environment. The operation of ships and ports consumes a lot of unsustainable resources and generates greenhouse gas emissions, thus generating a huge amount of carbon emissions. According to the last TERM report of the European Environment Agency (EEA), “shipping activities result in the emission of large amounts of greenhouse gases and air pollutants, noise and water pollution. If no further action is taken, by 2050, global shipping carbon dioxide Emissions may account for 17% of all carbon dioxide emissions. Although the emissions of some pollutants from road transportation have dropped overall, emissions from aviation and shipping continue to rise.” Therefore, how to improve the sustainable development of international trade logistics is an important problem that BRI and the world's international logistics and port design urgently need to face and solve.

It has been over 50 years since the first container terminal was put into use, and the world has dramatically changed due to this event. We have come quite far from the days of pre-containerization, break-bulk shipping. Technology has enabled us to begin to automate container terminals and thus reduce dependence on manual labor and increase efficiency.
Some ports are advancing rapidly, however, older technology is still in use in the less developed areas of the world. Unfortunately, it could be many decades before new technologies reach these ports, creating a challenge for the global shipping industry. Furthermore, shipping vessels continue to grow in size and the development of mega ships creates further challenges in respect to the abilities for container terminals around the world to handle the capacity.

2.3 Sustainable Port Design

As international trade and freight volumes continue to grow, ports around the world are looking to new technologies to help manage resources in a more sustainable and cost-effective manner. Shipping causes about 20% of the world's waste and residues to be released into the sea. The busier the port, the higher the risk of local contamination. This means, they represent a danger to the environment, as port is a traditional word that includes a conflict between human behavior and the environment. In addition, transportation is closely related to the concept of "green" development and sustainable development, as the seaport is a key transportation node. (PPA 2019)
In 2017, the Port of Rotterdam launched a campaign called "Building a Sustainable Port", emphasizing that a port's sustainability doesn't just mean focusing on environmental issues, but should also aim to make the port safe, healthy and attractive. In particular, sustainability should be aimed at creating

economic and social value. Three main features of port sustainability are envisaged, namely: a safe and healthy environment, climate and energy, and people and employment. Therefore, ports should focus on areas such as water security, solar energy and port welfare. (PPA 2019)

From an economic and environmental point of view, sustainable port development is not only a very important issue for the government as a port management agency, but also an important issue for port authorities and terminal operators. Ports directly affect international and domestic cargo transportation and local and national economic and social development. It is particularly important to coordinate the roles and functions of various ports with the Sustainable Development Goals (SDGs). Since ports not only emit carbon dioxide through cargo handling equipment, related facilities, and berthing ships, but also emit various air pollutants, the introduction and promotion of environmental protection policies by ports has become an urgent policy agenda.
In this context, the focus of the project is to promote the achievement of Sustainable Development Goal 9.1 (development of high-quality, reliable, sustainable and resilient infrastructure, including regional and cross-border infrastructure, to support economic development and human well-being, with a focus on Affordable and equal access by all) and 9.4 (by 2030, upgrade infrastructure and transform industries to make them sustainable, improve resource efficiency, and increase the use of clean and environmentally sound technologies and industrial processes. Countries are based on their respective capabilities) (UNESCAP 2020)

Port sustainability is defined as the strategies and activities that a port undertakes to meet current and future needs of those who use it, while protecting and sustaining human and natural resources. It considers social, economic and environmental issues.

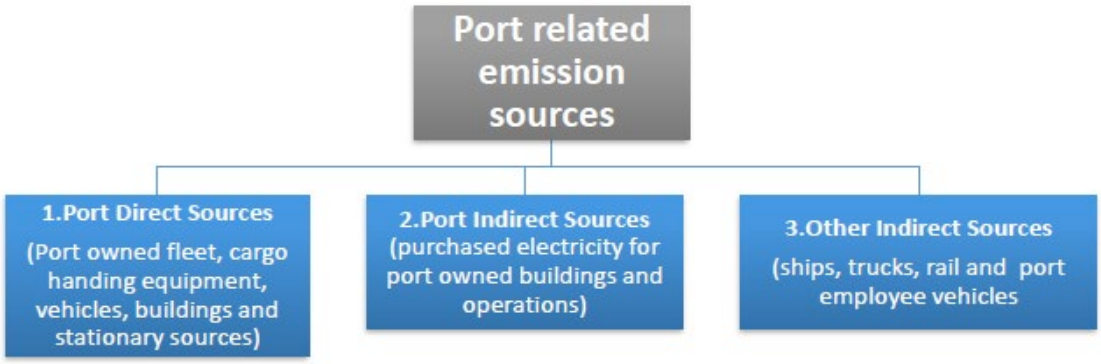

Figure 12: Port Related Emission Sources (2019), Source: Action Plan for a Sustainable and Low-carbon Port of Piraeus (PPA 2019)

2.3.1 Measures and Techniques

Green Marine Program

Green Marine is an environmental certification program for the North American marine industry. It is a voluntary, transparent and inclusive initiative that addresses key environmental issues through its 14 performance indicators. Participants are ship owners, ports, terminals, Seaway corporations and shipyards. To receive their certification, participants must benchmark their annual environmental

performance through the program's self-evaluation guides, have their results verified by an accredited external verifier and agree to publication of their individual results. And Europe has more and more participants in this program, the Green Marine Europe label functions according to the same model of rigour and transparency as in North America.
So that, shore power and alternative fuels have recently gained popularity among global ports because of stringent international regulations to reduce air emissions from ships. (Walker and Adams, How shipping ports can become more sustainable 2021)

Alternative Fuels
Among the proposed alternative fuels for shipping, DNV GL has identified LNG, LPG, methanol, biofuel and hydrogen as the most promising solutions. Among new technologies, the classification society believes battery systems, fuel cells and wind-assisted propulsion to offer potential for ship applications.

Fuel cell systems for ships are under development but will take time to reach a level of maturity sufficient for substituting main engines. Battery systems are finding their way into shipping; however, on most seagoing ships their role is limited to enhancing efficiency and flexibility. Wind-assisted propulsion, while not a new technology, will require some development work to make a meaningful difference for modern vessels. (Walker and Adams, How shipping ports can become more sustainable 2021)

Hydrogen is currently under consideration as an alternative, zero carbon fuel. Powering vessels with hydrogen can be achieved via combustion engines, blending hydrogen in with other fuels, or storing it in a liquid organic solution or as ammonia. The most common and greenest way of generating power from H2 is using hydrogen fuel cells. (Sustainable-world-ports, Hydrogen as a fuel n.d.)
The Clean Marine Fuels Working Group is busy adapting its current suit of tools for port authorities, terminal operators and bunkering companies to include other cryogenic fuels such as hydrogen.

Methanol is emerging as a potential alternative fuel for shipping. When produced from sustainable hydrogen and CO2 by direct air capture, it is a carbon neutral fuel. The Clean Marine Fuels Working Group is working on developing safety tools for Methanol as a marine fuel. (Sustainable-world-ports, Methanol as a fuel n.d.)

Reduce Underwater Noise Levels
Sound is a critical sensory stimulus underwater, where it travels much farther than it does in air. Many marine species—from whales to larval and juvenile reef fishes and invertebrates —rely on sound to navigate, feed and reproduce. Anthropogenic noise interferes with these activities and has harmful effects on animal behavior, hearing and other bodily functions.
President of Chamber of Shipping of America, Kathy Metcalf says, "about 85 percent of shipping noise comes from propellers." Specifically, this arises from cavitation—a propeller design issue that sometimes causes a breakdown in water flow over the blades and can result in lost energy, fuel inefficiency and noise.
One area that is ripe for reducing noise is pile driving at offshore wind farms. Acoustic bubble curtains have increasingly been used to dampen sounds from this process. Perforated pipes encircle the pile

driver, blowing a wall of air bubbles that absorb and refract the noise, reducing it by as much as 15dB. This amounts to a reduction in acoustic energy of about 95 percent. (Polidoro 2021)

LNG Bunkering Facilities

The shipping industry is gradually turning to liquefied natural gas (LNG) as a fuel for ships and tankers amid concerns about the impact that traditional fuels, such as diesel, could have on the environment.
A report by Deloitte published earlier in June revealed that LNG is slowly but surely becoming the preferred solution among ship owners and operators. Some 120 LNG-powered ships currently exist around the world, while another 130 are on order.
When it comes to CO2 emissions, LNG is the fossil fuel producing the lowest amounts. Engine manufacturers claim that the tank-to-propeller (TTP) CO2-equivalent emissions of Otto-cycle dual-fuel (DF) and pure gas engines are lower than those of oil-fuelled engines.

Ports that provide liquified natural gas (LNG) for ship refuelling can also help reduce air pollutants and greenhouse gas emissions. Cargo and cruise ships need to refuel or "bunker," as it is referred to in the marine industry, when they arrive at a port. (Walker and Adams, How shipping ports can become more sustainable 2021)

Shore Power

While docked at port, ships require power to maintain their lights, heating, cooling, and other essential vessel functions. Typically, this power is provided by running the ship's diesel-fueled auxiliary engines. Shore power, also known as cold-ironing or alternative marine power, is the process of providing electrical power from the shore to a ship while it's docked, thereby allowing ships to shut off their diesel-powered engines when berthed and connect to the electricity grid to reduce local air pollution and greenhouse gas emissions. (Clear-seas 2020)

Shore power saves consumption of fuel that would otherwise be used to power vessels while in port, and eliminates the air pollution associated with consumption of that fuel. Use of shore power may facilitate maintenance of the ship's engines and generators, and reduces noise.
China has implemented widespread onshore charging stations and will have 500 shore power units installed by 2020 to allow ships to turn off their engines and use local electricity to power refrigeration, lights and other equipment when docked. This is particularly effective at reducing greenhouse gas emissions when powered by renewables. China has also launched local incentive programs to encourage the shipping industry to increase its use of renewables. (Walker, Why decarbonizing marine transportation might not be smooth sailing 2019)

Chapter 3. Case Study

3.1 Reason of Choosing These Cases

In the taxonomy of many construction projects along the Belt and Road, I chose free exchange space to focus on, and among the 7 cases in this classification (refer to the "free exchange space" family in the chapter 1), I chose the following 3 cases: Colombo City Port, Djibouti international free trade zone and Piraeus Port.

They were selected, first because these three are large seaport free trade zones supported by BRI instead of dry port, so they are more relevant to the feasibility study of Italy cooperation with BRI (FTZ in Venice). In addition, these three cases are located in Southeast Asia, Africa and the Mediterranean Sea respectively, which can reflect the different emphases and characteristics of the BRI free trade port projects invested and constructed under different social and environmental backgrounds.

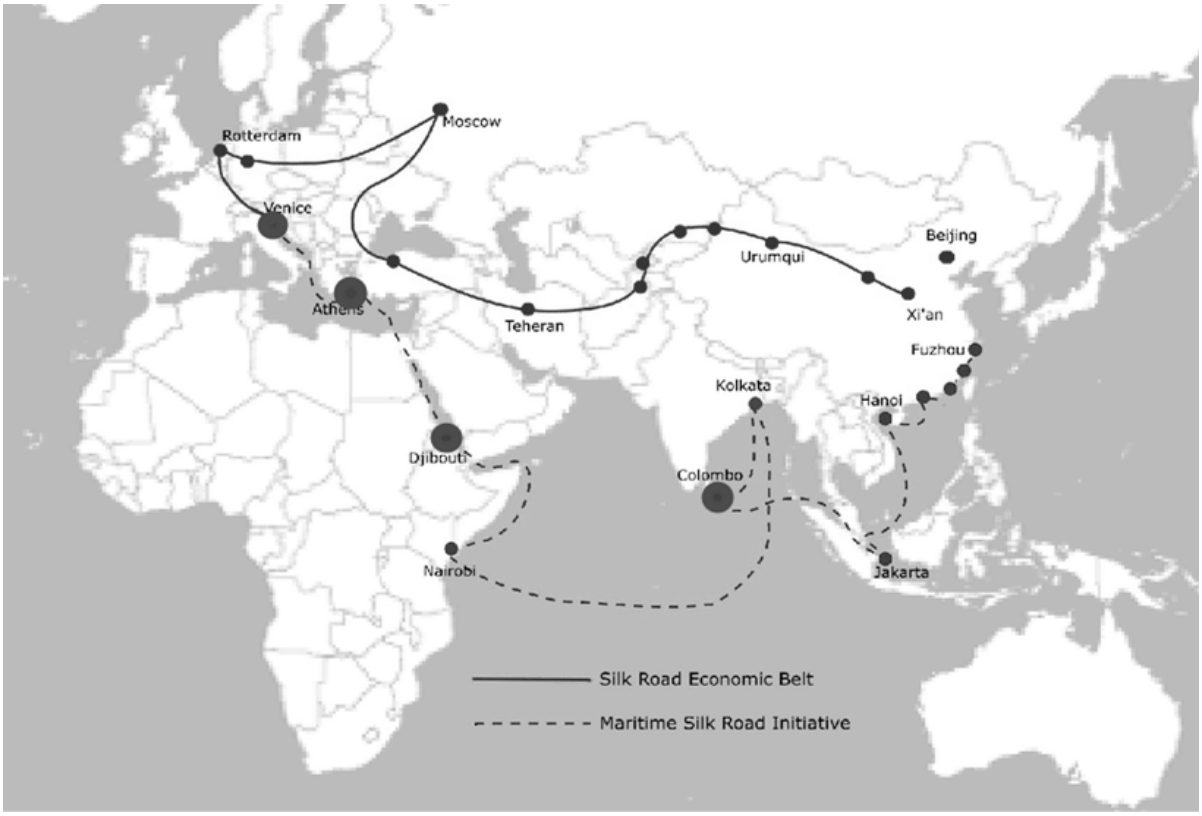

Figure 13: 4 cases position in BRI, (drawn by author)

3.2 Colombo City Port & Colombo International Container Terminal

Sri Lanka has been known as the "Oriental Maritime Crossroad" since ancient times. It is the only place for maritime traffic between the East and the West in the Indian Ocean and an important stop on the ancient Maritime Silk Road. China and Sri Lanka have been in business since ancient times.

From the perspective of the hinterland economy, Sri Lanka radiates in the South Asia region where the economy is developing rapidly. The hinterland has huge economic growth potential; from the

perspective of international trade, it is located on the busiest Asia-Europe route and is the most important shipping and aviation hub in South Asia.

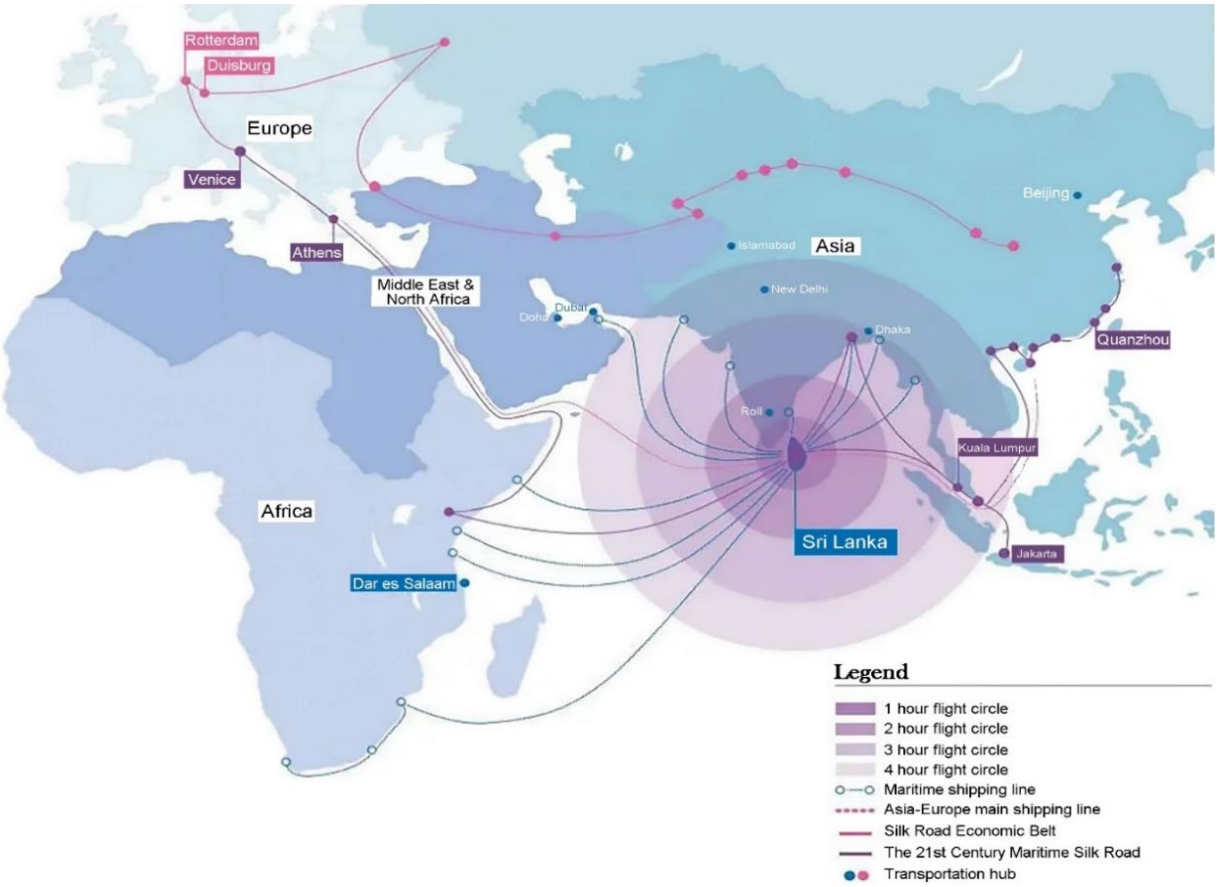

Figure 14: Sri Lanka's position in BRI, (drawn by author)

In Colombo, there are two projects I focus on: The Port City of Colombo (PCC) and Colombo International Container Terminal (CICT)

The Port City of Colombo (PCC) is one of the key projects of the BRI, the flagship project of Sri Lanka's "Greater Western Province" strategic plan, and an important cooperation project between China and Sri Lanka. After the completion of the project, its goal is to become a commercial, financial and leisure tourism center in South Asia, which could have a positive impact on Sri Lanka's economic development, improvement of people's livelihood, and improvement of the region

Colombo International Container Terminal (CICT) is arguably the first BRI investment in Sri Lanka, although the project predates the official announcement of the BRI. It's on the north side of the PCC. CICT is strategically located in the center of the East/West shipping route.And it is the first and only Deepwater terminal in South Asia capable of handling the largest vessels afloat. And CICT is well practiced in terms of green port terminals, so it is a great BRI sustainable port case for study.

Figure 15: Map of PCC and CICT, (drawn by author)

3.2.1 PCC Project Overview

Project location: The PCC project is located in the coastal waters south of the South Port of Colombo, the capital of Sri Lanka, and is connected to the existing Central Business District of Colombo. Directly in front of the Secretariat of the Presidential Palace, Sri Lanka's Ministry of Foreign Affairs, Ministry of Finance, Central Bank and other major government departments, as well as many five-star hotels such as Shangri-La and Hilton, are located within 1 km of the project.

Project construction content: The project is a large-scale land reclamation and new city development project invested and developed by China Harbour Engineering Co., Ltd. (hereinafter referred to as "CHEC"), a wholly-owned subsidiary of China Communications Construction, with a land area of 269 hectares, of which commercial The development land is about 178 hectares, and the planned construction scale is 5.73 million square meters. PCC is a new city development project that integrates commercial, business, residence, leisure and entertainment, medical education, and other life and work needs. It includes residential, office buildings, retail malls and hotels, as well as convention and exhibition centers, international schools, and international medical services. Center, marina, theme park, central park, landscape waterway, beach, etc. (Offshore-energy 2014) The port city is expected to have a development period of about 25 years. After completion, it will become a business and commercial center in South Asia and a tourist and leisure center that attracts global attention.

Project cooperation mode: The project is a typical public-private partnership (PPP). CHEC is responsible for investment and financing, planning, and construction (including the supporting construction of all municipal facilities in the port city), and has obtained 99-year lease rights for part of the commercial land. The Sri Lankan government is responsible for providing construction and environmental permits for the sea area rights project where the project is located, as well as supporting work for the peripheral municipal infrastructure.

Figure 16: Bird's eye view of PCC, Source: https://www.portcitycolombo.lk/

3.2.2 PCC Project progress

Sri Lankan government promulgated the "Port City Special Economic Zone Act" in 2017, which aims to improve the convenience of doing business in Sri Lanka, attract foreign direct investment, drive the country's economic development, and build Colombo into an international financial center in South Asia.

The Port City Special Economic Zone Act includes business facilitation policies, preferential tax conditions, high-end talent introduction policies, commercial courts and dispute settlement centers, free capital in and out, and offshore businesses. In the future, the port city special economic zone will enjoy Sri Lanka's most competitive investment convenience and tax preferential policies, which are of great significance to attract foreign investment, drive Sri Lanka's economic development, and improve Sri Lanka's national economy. Economic governance, attract high-end talents.

Project construction progress: On January 16, 2019, the project was completed for land reclamation, forming a total land area of 269 hectares, 2 months ahead of the planned construction period. The hydraulic structure and land backfilling of the project was completed, and the completion certificate was issued on August 28, 2019. The municipal project started on July 19, 2018 and is scheduled to be completed and put into operation in mid-2022. On November 15, 2019, the project company and Sri Lanka Urban Development Bureau formally signed the lease agreement for our land parcel in the first phase of the project, and the land registration was completed on December 18, 2019. (Offshore-energy 2014)

Project planning progress: At present, the control plan of the port city and the environmental assessment of urban development have been approved by the Sri Lankan government. The conceptual planning of the project was completed by the internationally renowned consulting company SWECO, Sweden, and the regulatory planning was completed by the world-renowned planning company Singapore Shengyu. The regulatory planning won the 2017 Silver Award in the Competition held by the Singapore Association of Landscape Architects, and China's "Yuan Ye Cup" 2018 The Urban Design Award won the gold medal; the overall landscape concept design of the project won the 2018 Design Competition Master Planning Group Winner Award jointly organized by the three major regional centers of the International Federation of Landscape Architects in Asia-Pacific, Middle East and Africa.

Regulatory planning is one of the statutory conditions for land sales in Port City. It puts forward index requirements for the nature of land use, building volume ratio, building density, building height, etc. of commercial development land in Port City. Constraint requirements put forward specific requirements for urban green buildings, energy conservation and environmental protection, sound and light control, and garbage disposal.

3.2.3 PCC's Plan and Design

The new city will comprise five main urban precincts / districts, which namely: International Island, Island Living, Central Park Living, Financial District and The Marina.

International Island will be a commercial and leisure destination featuring a resort and theme park, convention and exhibition center, healthcare and education facilities, as well as a waterway park. International island will have medium density, and there will be 5 main functions which are channel pack, convention & exhibition, integrated resort and theme park, entertainment and business. The waterway park is a public park and walk along the north marina. A link visual and physical link towards the water. The canal quays are important public walks. Squares that offer meeting-places, destinations and view-points are placed at strategic places along the quays.

The Island Living district will feature villa-style residences and public parks, including the Malvathu Park. A city beach will run along the southern edge of the district. Island living has medium density with open block, it is the green heart of the Colombo port city and there will be the channel, central park, pavilions.
Cinnamon Park is a linear park running from North to South through the center of Port City. A sequence of 7 small parks using repeating typologies according to the adjacent land use. Enclosed spaces with individual character. Places to sit and relax sheltered and screened from the surrounding bustle of City Life. A swale for storm water management runs through the park.
Malvathu Park forms the southernmost point. This is a 'tropical garden' with hills and views. It is a place to shelter from the fast pace of the City and feel the breeze from the sea yet feel enclosed in a unique and personal space.
City Beach running along the entire southern edge of Port City. Open skies and a fresh breeze will make the beach a destination for everyone visiting Colombo. This area offers a multitude of opportunities for relaxation from reading a book in a waterside restaurant to more active endeavours; sailing, diving or motorised watersports. Along the beach activities such as sport and play is located.
The main boulevard is a characteristic street with a public transportation system. Different type of trees and planting in different areas creates variation along the boulevard. The Small Sea Squares that offer meeting-places and view-points towards the sea are placed at strategic places along the water-front.

The Central Park Living district will include open blocks, public parks and pavilions. Central park living has medium high density, and there will be city beach, pagoda park, cinnamon park, lotus boulevard and villa living.
The public park centrally located, flanking the main canal. Large linked green open spaces delineated by structural tree planting and woodland copses. A sense of close proximity to water with opportunities for events and informal recreation including walking/running trails and small sport facilities.

The Financial District will offer Grade A office space and serve as a retail destination. The Marina provides access to the sea and includes public parks and water features.
Canal quays and boulevards across all districts will serve as meeting points and viewpoints. The development is protected from rising sea levels and high waves by a 3km-long offshore breakwater. Financial district has high density, it is the “retail destination” with the grade A office building, commercial boulevard, linear park and CBD plaza.
Main BOULEVARD The boulevard is a characteristic street with a public transportation system. Different type of trees and planting in different areas creates variation along the boulevard. At the CBD area the boulevard has a more formal character with palms and flag posts.
Lighthouse cultural park running along the eastern boundary of Port City. A connection between old

Town Colombo and Port City the park is a place for cultural interaction and meetings. Specimen trees, plantings and interpretation boards provide opportunities for ecological and historical education.
CBD Plaza This square is located in the middle of the shopping complex in the CBD area at both sides of the boulevard. The two different parts of the square are connected with a shared space across the boulevard.
Canal quays The canal quays are important public walks. Squares that offer meeting- places, destinations and view-points are placed at strategic places along the quays.
New Louts Roundabout is specially designed with for example water features and greenery.

The Marina will have low density, it can be looked as a small marina village with marina square, promontory square and parks.
Marina promontory square is a destination along the marina-walk with long-reaching views towards the sea.
Marina square is clearly dominated by boats and activity around the open water of the marina. Open public space by the water offers places to sit and experience the varied activities in the marina. The walkways along the quays will be a part of a marina walk. Marina park can be a visual and physical link towards the water and marina.

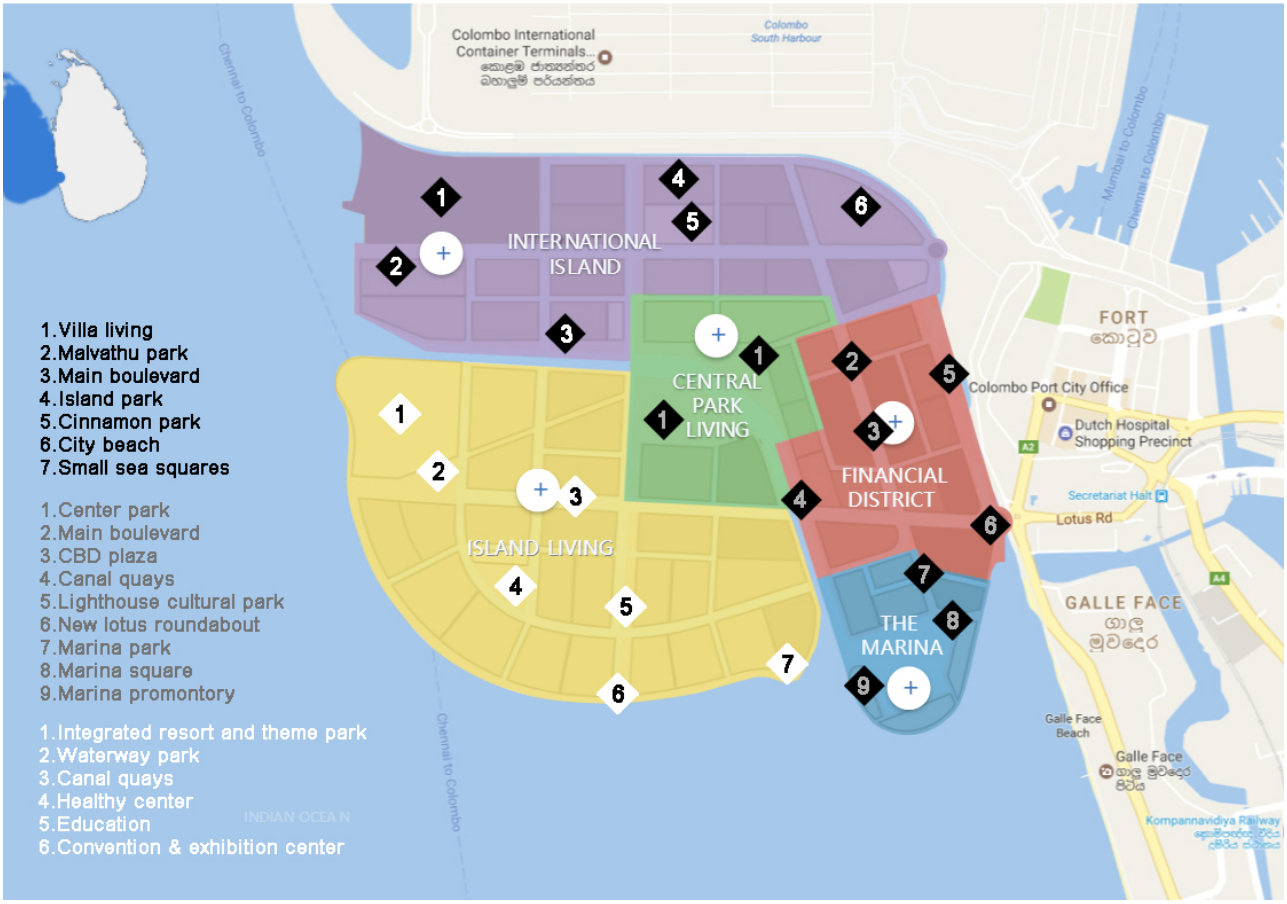

Figure 17: Function Plan of Colombo City Port, (drawn by author), Data source： https://www.portcitycolombo.lk/

3.2.4 CICT Project Overview

The Port of Colombo is located on the southwest bank of the Kailani River in Colombo and is the

largest and busiest port in Sri Lanka. Located in the Indian Ocean, the port is an important terminal in Asia and handles most of Sri Lanka's foreign trade.

In order to meet the growing service demand of the international shipping industry, the Sri Lankan government launched the Colombo Port Expansion Project (CPEP) to develop the southern port area. CICT is one of the project in CPEP. CICT is one of the important investment projects in Sri Lanka, with a total investment of more than 560 million US dollars. China Merchants Port Holdings Co., Ltd., a subsidiary of China Merchants Group, holds 85% of the shares and the Sri Lanka Port Authority holds 15% of the shares. Since the project was completed ahead of schedule and put into operation in 2014, the project has achieved significant economic and social benefits. Benefiting from the improved performance of the Colombo International Container Terminal in Sri Lanka invested by China, the container throughput of Colombo Port increased significantly in 2016, reaching 5.734 million TEUs, an increase of 10.6% over 2015. (Xinhuashe 2021) And CICT has reported handling 2.65 million TEUS for the 12 months ending 2018, recording a 13% increase in its annual throughput and contributing 38% of the Port of Colombo's volumes in 2018.

Figure 18: Bird's Eye View of CICT, Source： *https://newsin.asia/sino-lankan-container-terminal-cict-reports-amazing-performance/*

3.2.5 CICT Green Measure

CICT explicitly stated its objective to operate as a green terminal from the onset of operations in 2015; this commitment, combined with a drive for commercial success, has led to positive outcomes for CICT in terms of growth and likely, profits, with low pollution and carbon output thus, creating a business case for green policies in port operations.
CICT has prioritised the preservation of the surrounding ecosystem and introduced low-carbon, anti-

pollution policies and technologies, as well as renewable energy sources for their operations. One of the major capital investments CICT has made to address environmental challenges is the use of green technologies, such as electrified cranes over the use of diesel powered ones. The engines on these cranes have zero output of carbon dioxide and minimal output of any greenhouse gases. (Islam 2019)

CICT has completed a project to convert the company's diesel-operated rubber-tyred gantry cranes to electric-powered rubber-tyred gantry cranes or E-RTGs, making a major contribution to efforts by the Port of Colombo to go Green.
Costing more than $10 million, the project has resulted in CICT deploying 40 zero-emission E-RTGs at the company-managed Colombo South container terminal, achieving a 45% reduction in the terminal's overall carbon dioxide emissions to the environment and a reduction of more than 95% in diesel consumption. However, with the growing emphasis on addressing and reducing environmental damage on a continuous and sustainable basis in the maritime and port industry, CICT decided to make further significant capital investments in its contribution to reduce green-house gases. (Islam 2019)

CICT further pursues policies to reduce air pollution and carbon emissions through energy reduction and energy-saving policies. More than 80% of electric power generated is using solar power sources at CICT. CICT has reduced their emission levels by 90% by using solar panels for energy generation, and it continues to move all operations towards a green mode of energy sources.
As a testament to the business case of implementing green policies, CICT is considered Colombo port's most profitable and efficient terminal, surpassing expectations of cargo volumes in only 3 years of operations. CICT contributed 70% of the cargo volume moved by Colombo Port in 2016 by accessing global network of shipping lines that move goods from Asia to Europe. (Islam 2019)

Technical Data of Port City of Colombo (PCC)	
Land Owner	China Communications Construction Company (CCCC); Sri Lanka Authority
Designer	SWECO
Cooperation Start Year:	April,2014
Location	Colombo, Sri Lanka
Site Area	2,690,000 m²
Typology	Special Economic Zone

Figure 19: Technical data of PCC, Data Source: https://www.portcitycolombo.lk/

Technical Data of Colombo International Container Terminal (CICT)	
Owner	China Merchants Port Holdings Co., Ltd.(85%); Sri Lanka Port Authority holds 15%
Architect	China Merchants Port Holdings Co., Ltd.
Cooperation Start Year:	2008
Location	Colombo, Sri Lanka
Site Area	570,000 m²
Berth Depth	18 m
Container Yard	100,000 m²

Figure 20: Technical data of CICT, Data Source: https://www.slpa.lk/port-colombo/terminals

3.3 Djibouti International Free Trade Zone (DIFTZ) & Port & Terminal

Djibouti is at the center of global trade routes and on two of the three busiest shipping routes in the world. Its location connects Africa to Asia, Europe and America. Thousands of millions of goods travel through the region every year.
Located at the intersection of the Red Sea and the Gulf of Aden in the Horn of Africa, Djibouti has long advertised its geostrategic location as a critical entry point into African markets.
Djibouti is located before the Suez Canal. The Suez Canal is the gateway to trade between East and West markets, which means that it provides commercial shipping with a presence close to one of the busiest trade routes in the world.

Figure 21: Sri Lanka's Position, Source: https://www.britannica.com/ biography/Hassan-Gouled-Aptidon

Near the port of Doraleh in Djibouti, there are three projects related to BRI free exchange space, they are Djibouti International Free Trade Zone (DIFTZ), Doraleh Multipurpose Port (DMP) and Doraleh Container Terminal (DCT). They are all owned by China Merchants Group to some extent

DIFTZ will to be the largest free trade zone in Africa once complete its construction, presents dynamic new opportunities for businesses from around the world. DIFTZ is a model of China-Africa cooperation in the new era, and an important carrier to undertake the BRI. With the support of the Djibouti and Chinese governments, the Djibouti Port and Free Trade Zone Administration and China Merchants Group have joined forces to integrate advantageous resources and jointly build a FTZ.

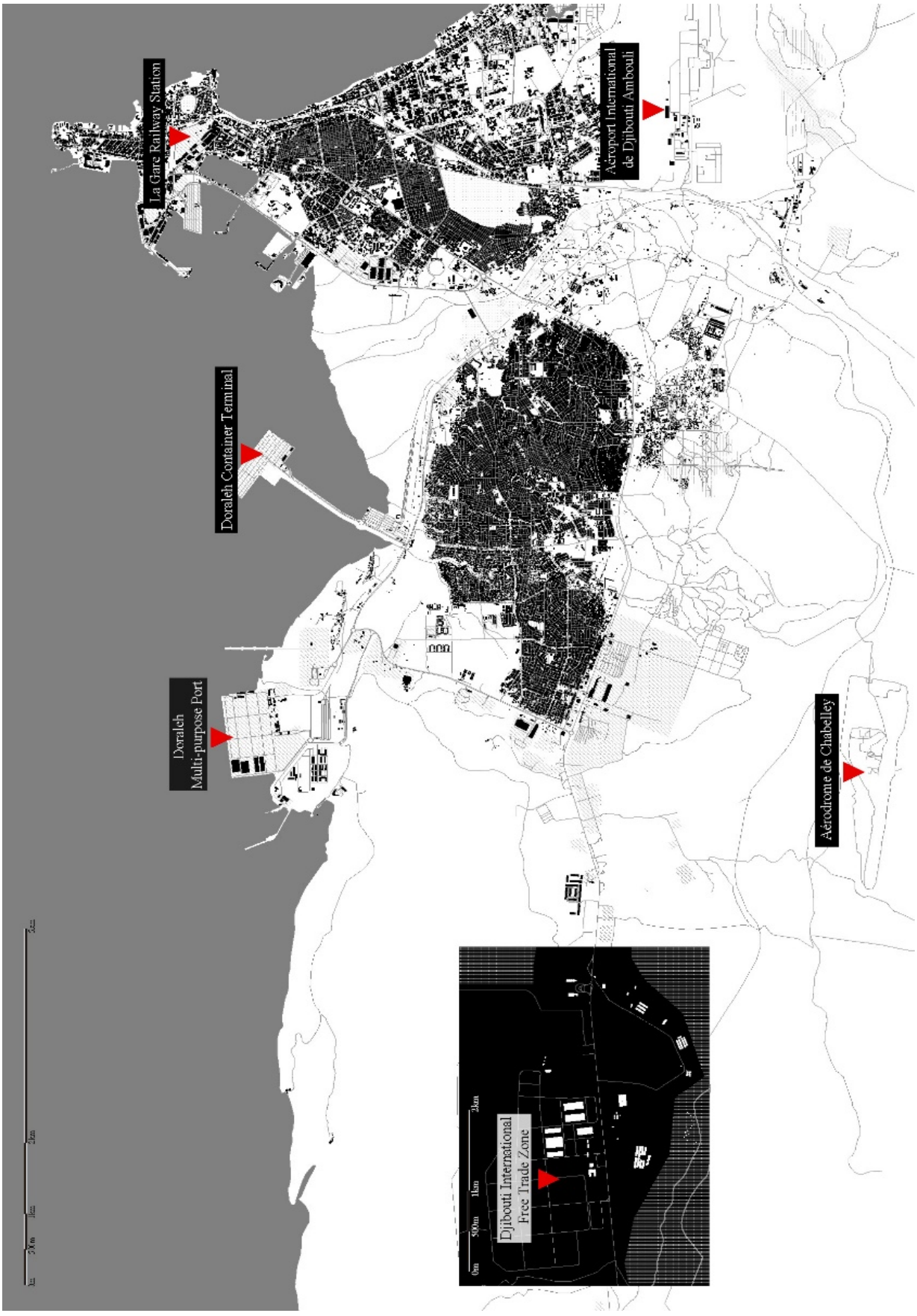

Figure 22: Map of DIFTZ and Port, (drawn by author)

3.3.1 DIFTZ Project Overview

DIFTZ is an important part of the BRI project. After canceling the contract with DP World in Dubai, Djibouti also signed an agreement with Singapore-based Pacific International Shipping Company to increase the number of cargo containers handled at the port, which cooperated with China Merchants Port Holdings. Shares in the port of Djibouti.

An agreement to build a 48 square kilometers (19 square miles) FTZ was signed in March 2016 as part of China's expansion of trade routes. In January, 2017, the President of Djibouti officially launched a project known as Africa's largest FTZ.
On July 5, 2018, Djibouti opened the first phase of DIFTZ. The project cost 3.5 billion US dollars. This $370 million pilot zone covering an area of 240 hectares is composed of four industrial clusters, focusing on trade and logistics, export processing, commercial and financial support services, and manufacturing and retail of duty-free goods. (Dahir 2018) The opening of the area coincided with Djibouti's hosting of the Africa-China Economic Forum, which brought together government officials and the private sector to promote economic cooperation.

Djibouti hopes that the International Trade Zone will not only enhance its status as a center of trade and logistics, but also create employment opportunities for young people. Most importantly, it hopes to provide a strategic foundation for global companies wishing to enter the fast-growing African market. Together with Djibouti, DIFTZ will be managed with three other Chinese companies, namely: China Merchants Group, Dalian Port Authority and IZP. (Dahir 2018)
After completion, DIFTZ will become Africa's largest free trade zone, providing specialized logistics, retail, commercial support and processing facilities, and it is reported that it will bring about 350,000 new jobs in the next ten years. It will also house the business district of Djibouti scheduled to be completed in 2021. (Clemoes 2020)

The agreement requires the region to process $7 billion in trade within two years. According to the agreement, Djibouti will establish a unified customs system with China, establish a transit trade center, and establish a currency clearing system. The Chinese company is also expanding Djibouti's Dolarelh multi-purpose port, which is expected to cost 590 million U.S. dollars. Also it is planned to build two new airports at a total cost of 599 million U.S. dollars. The larger of the two facilities-scheduled to be completed in 2018-is located 25 kilometers south of Djibouti City, with an annual passenger throughput of 1.5 million passengers and a cargo throughput of 100,000 tons. The second facility is located in the north and can accommodate 767,000 passengers per year.

Figure 23: Bird's eye view concept of DIFTZ, Source: www.skyscrapercity.com

3.3.2 DIFTZ Project Detail

The initial phase, a 240-hectare zone, is the result of a $370 million investment and consists of three functional blocks located close to all of Djibouti's major ports. The full free zone will focus on the development of industries such as the logistics, marine, construction, automotive, and home electrical industries. The DIFTZ is equipped with advanced facilities including high-speed telecommunications, power and water supplies, roads and parking lots.

The pilot zone has four industrial clusters which focus on trade and logistics, export processing and business support:
1. Logistics Industry Cluster: transportation, bonded warehousing, logistics and distribution;
2. Business Industry Cluster: bulk bonded goods transactions, merchandise display, duty-free merchandise retail;
3. Business Support Cluster: financial services, information services, hotel dormitories, office buildings, training, intermediary services;
4. Processing Manufacturing Cluster: packaging production, light processing of incoming materials, food processing, marine products, auto parts assembly.

Djibouti Free Zone (DFZ)
In operation since October 2004, DFZ has been contributing to the creation of a welcoming business environment for investment and regional trade in Djibouti. Whilst the DIFTZ, opened in 2018, focuses

on international trade, the DFZ already positioned Djibouti as a regional logistics, trade and marketing hub for import activities, warehousing, processing and re-export of goods to and from East Africa.

The DFZ takes 40-hectare area, close to Djibouti's ports and airport:
- 2 warehouses of respectively 614 m² and 1,340 m² (with integrated office units)
- Serviced land plots with utilities ranging from 2,000 m² to 15,000 m²
- Light industrial units of 510 m² (with integrated office units)
- A 9,100 m² hangar designed to accommodate aid cargo

3.3.3 DMP Project Overview

In order to relieve congestion at the former port of Doraleh inaugurated, DMP was designed in May 2017: in under a year, waiting time to discharge goods was reduced from weeks to days. (HKTDC 2021) The DMP boasts some of the most modern facilities in Africa.
The DMP has terminals for handling oil, bulk cargo, containers and livestock. Before seized by the government of Djibouti in 2018, it was partially owned and operated by DP World and China Merchants Holdings. (Portstrategy 2018)

3.3.4 DMP Project Detail

The DMP accommodates vessels with up to 100,000 DWT and boasts some of the most modern facilities in Africa:
-A range of terminals including bulk, break, container and RoRo
-1,200 meters of quay line, accommodating 6 berths with a depth of 15.3m
-690 hectares of land for industries
-Average performance of 90 units discharged per hour (RoRo) and 31 containers per hour (LoLo)
-Direct connection to the Djibouti-Addis Ababa railway (HKTDC 2021)

The total investment was $590 million. And there are plans to expand the DMP further, to reach 4,130 meters of quay line, and 17 berths.

3.3.5 DCT Project Overview

To leverage the geographical strategic opportunity and to diversify its port operations, the Djibouti government decided to build a new container terminal in Doraleh, a location just outside Djibouti City.

The Djibouti government and Dubai Ports (DP) World, a Dubai-based, multinational port terminal operator, entered into a joint venture (JV) called the Doraleh Container Terminal SA (DCT). DCT is 67% owned by PAID (Port Autonome international de Djibouti – the old port of Djibouti authority) and 33% owned by DP World. The JV is responsible for the development, financing, design, construction, management, operation, and maintenance of the container terminal under a 30- year, Build-Operate-Transfer (BOT) PPP structure.

3.3.6 DCT Project Detail

The DCT with an annual capacity of 1.5 million shipping containers, since it opened in 2009, it is estimated to have created around 10,000 direct and indirect jobs. It was regarded as Africa's most advanced container terminal, equipped with modern facilities offering world-class productivity of 34m/hour/crane average. It has been reported that the net income of the new terminal ranges between about USD 55 to 80 million per year.

DCT is lacking in technologies related to sustainable green terminals, and has hardly applied the advanced technologies mentioned in the previous chapter (Chapter 2 and the CICT case) during later operations that can reduce environmental impact. However, it can also be seen that in the early stage of DCT project planning, the African Development Fund made a detailed assessment of the impact of the project on the environment and society from various aspects, such as: topography, geology and soil, air quality, climate, seawater, groundwater quality, terrestrial ecology, marine flora and fauna, transportation, waste, visual, social and economic and cultural heritage. Following an assessment of these issues, highly detailed solutions are given, such as: the use of modern machinery with adequate pollution control devices (such as three-way catalytic converters), and the use of appropriate fuels, including low-sulfur diesel and unleaded compliant Manufacturer-specified gasoline to reduce greenhouse gas carbon dioxide and nitrogen dioxide emissions; locally design and implement habitat compensation measures to restore an equivalent area of mangroves destroyed during construction and operations; ensure that all plants, machinery and vehicles All are equipped with appropriate mufflers to reduce noise and vibration during construction.

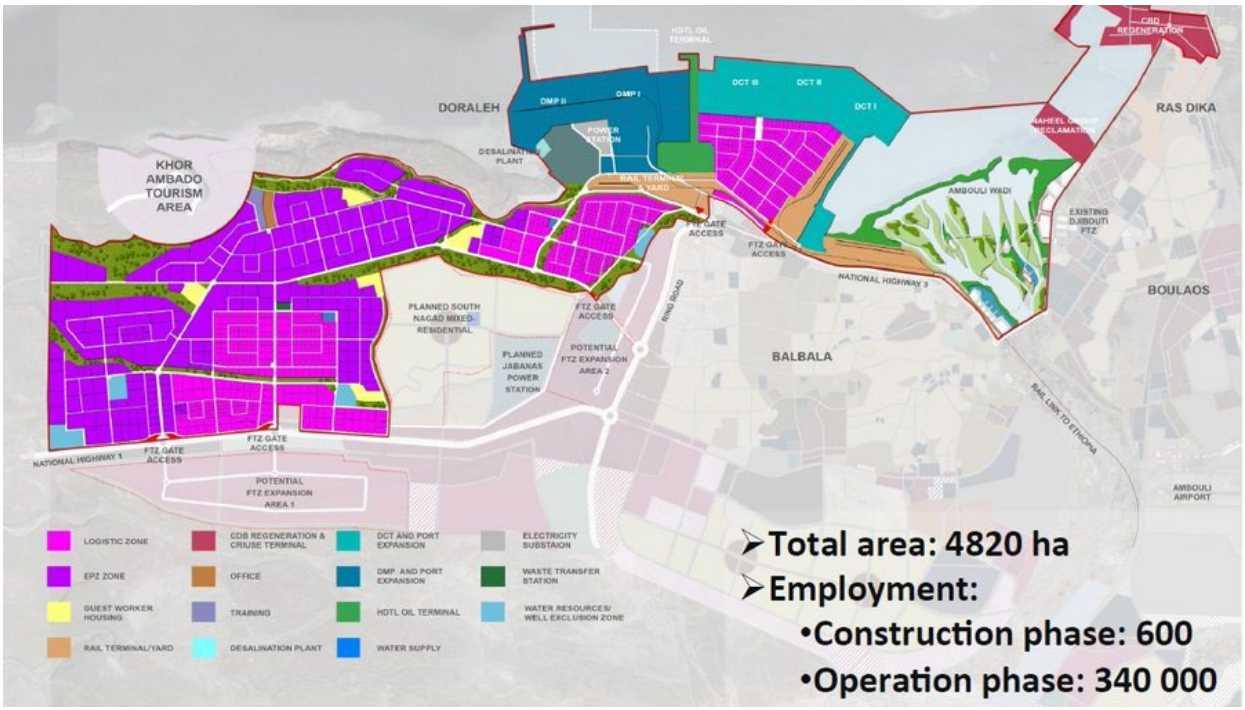

Figure 24: General Plan of DIFTZ and Port, Source: https://www.somalispot.com/threads/diftz-update.54895/

The main shortcoming of the existing legal and regulatory framework is the absence of any formal legislation on the protection of the environment and the requirements for safety and security related matters in the port. None of the legal documents that were presented provide information on the sustainable, safe, and secure development of ports toward their surroundings.

With the large port development plans that are currently envisaged, this is regarded a major drawback of Djibouti's legal and regulatory framework and it is recommended that DPFZA, PDSA or other government bodies include environmental, safety, and security standards in the legal and regulatory framework for the ports sector. Finally, the existing legislation does not clearly specify the role and regulations of the DPFZA, while that is the major body involved in the port developments in Djibouti. Even though DPFZA based on its mandate is under the direct jurisdiction of the President, it is regarded important that its formal role as port developer for the country is included in the country's legal documentation. (The-world-bank 2021)

Technical Data Of Djibouti International Free Trade Zone	
Owner	DPFZA; China Merchants Group; Dalian Port Authority; IZP Group
Architect	DPFZA
Construction Year	2017-2018
Location	Djibouti
Site Area	24,000,000 m²
Typology	Free Trade Zone

Figure 25: Technical data of Djibouti International Free Trade Zone, Data Source: http://dpfza.gov.dj/facilities/Free-trade-area/djibouti-international-free-trade-zone

Technical Data Of Doraleh Multi- purpose Port	
Owner	China Merchants Group; DP World
Architect	DPFZA
Construction Year	2009
BRI Cooperation Start Year	2017
Location	Djibouti
Site Area	6,900,000 m²

Typology	Port
Quay Length	1200 m
Berth Depth	15.3

Figure 26: Technical data of Doraleh Multi - purpose Port, Data Source: https://www.portdedjibouti.com/doraleh-multi-purpose-port/

Technical Data Of Doraleh Container Terminal (DCT)	
Owner	China Merchants Group; DP World
Architect	DP World
Construction Year	2009
BRI Cooperation Start Year	2017
Location	Djibouti
Site Area	-
Typology	Container Terminal

Figure 27: Technical data of Doraleh Container Terminal, Data Source: https://www.thegpsc.org/sites/gpsc/files/14._doraleh_container_terminal_djibouti.pdf

3.4 Piraeus Port

Piraeus, located in the southeast of Greece, is the main port of Athens and the city's gateway to the islands of the Aegean. It is the largest port in Greece and the busiest in Europe, which plays a crucial role in the development of international trade as well as the local and national economy. The port today has a range of activities concerning the Commercial and Central Ports, ship services and real estate development. It connects continental Greece with the islands and is an international cruise center and a commercial hub for the Mediterranean, providing services to ships of any type and size. (PPA 2019) Piraeus is considered the natural port of Athens The port of Piraeus is located 12 kilometers southwest of central Athens, on the east coast of the Saronic Gulf. It is the main gateway from mainland Greece to the Aegean Sea and Crete island. The port is very large, with 12 gates from which ferries depart.

It is the first European port after the Suez Canal with the necessary infrastructure to serve transit trade and overland transport. Situated near international trade routes, the port is a hub of international trade being the only European port in the East Mediterranean with the necessary infrastructure for the accommodation of transshipment cargo. The port of Piraeus is the main maritime transport hub in the Eastern Mediterranean of Greece. It has access to the Black Sea and the Balkan Peninsula, so it is one of the main cargo and passenger ports of the Mediterranean Sea. There are both international ferries and ferries to the many Aegean islands.

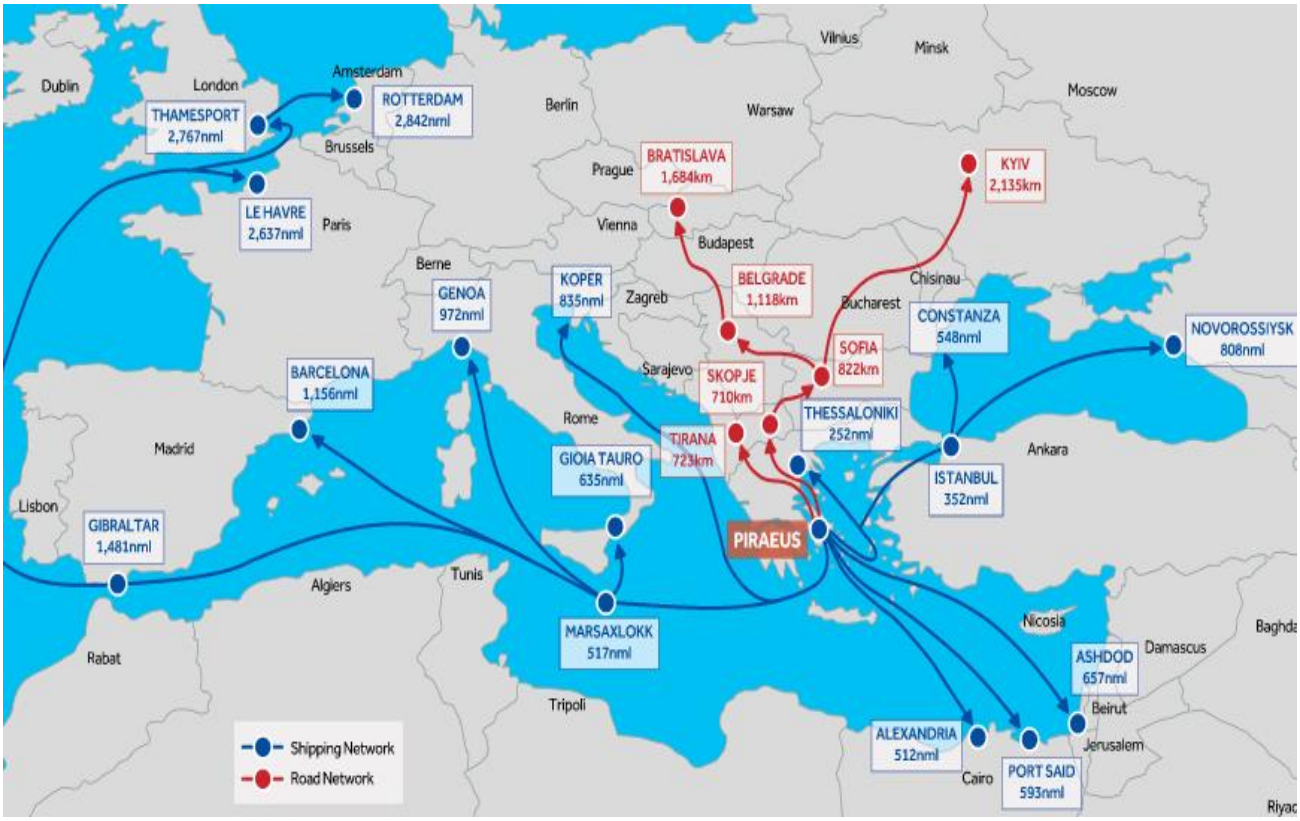

Figure 28: Main connections of Piraeus Port, Source: Action Plan for a Sustainable and Low-carbon Port of Piraeus (PPA 2019)

3.4.1 Piraeus Port Project Overview

The port of Piraeus is part of the BRI that connects China to Europe. since July 2020 one of the piers of the commercial port has been taken over for 45 years by the China Ocean Shipping Company, which was already active in Greece since many years. COSCO acquired a 51% stake in the port from the Asset Development Fund of the Hellenic Republic (HRADF) in 2016. The company can obtain an additional 16% of the equity, provided that the investment milestone is achieved.
Based on the cooperation project at Piraeus Port, Greece is called as a model for European countries to cooperate to build the "Belt and Road" with China. Along the 32-kilometer-long coastline outside Athens, the crane in the port of Piraeus is busy 24 hours a day loading and unloading thousands of containers transported between Asia and Europe. In less than ten years, the booming trade volume directly created nearly 2,000 jobs for the local area, transforming Piraeus into the busiest port in the Mediterranean.

The key to Piraeus' success is that China Ocean Shipping has invested in upgrading its infrastructure since 2008. At that time, the Greek government decided to privatize the operation of the port under the country's economic difficulties, and COSCO Shipping won a 35-year port operation contract. Thanks to COSCO's investment, Piraeus has jumped from the 93rd in 2010 to the 38th busiest container port in the world. During this period, the port's throughput increased by about 7 times.

Figure 29: Map of Piraeus Port, (drawn by author)

The Piraeus Port Authority is transforming the main port of Piraeus in Greece through a series of expansion projects. Renovation is part of the port infrastructure improvement plan. The port is the

largest port in Greece, with an annual passenger volume of up to 20 million passengers.
As part of the master plan, a total investment of 600 million euros (660 million US dollars) is planned to be invested in the modernization of the Port of Piraeus within a few years. One of the key projects of the expansion plan is the new terminal, which is currently under construction. The terminal project is expected to cost 103 million euros (115.8 million U.S. dollars) to develop, start construction in February 2020, and is expected to be completed by the end of 2022.

The improvement of the port will create new jobs and support the country's economic growth, and help strengthen the cruise shipping and tourism industry and reduce transportation costs. The overall plan includes future development plans and measures to improve the competitiveness of the terminal.

Figure 30: Bird eyes' view of Piraeus Port, Source: https://www.piraeus.org/the-port.html

3.4.2 Piraeus Port Project Detail

The Piraeus port has three terminals, two of which are managed by the Piraeus Container Terminal. The third terminal of the container terminal was completed in 2018. The container terminal is equipped with modern equipment and can serve the world's largest container ship.

The two ro-ro terminals cover an area of 191,000 square meters and the total length of berths is 1.5 kilometers. The terminal provides a total handling capacity of 600,000 vehicles per year, including five berths, and can accommodate ships with a draft of 11m.

Port of Piraeus Transformation: The port renovation includes upgrading the existing container terminal, constructing new cruise passenger handling facilities, and strengthening the ship repair area. Part of

the investment also be used to expand automobile transportation facilities and develop new port logistics facilities.
The renovation plan includes the construction of an additional passenger terminal and expansion of the existing cruise terminal. The new terminal is expected to increase the port's handling capacity by 3 million containers each year.

Tekal was awarded a contract to build a new terminal in the port of Piraeus. The new infrastructure will be built near the existing cruise ship facilities. The length of the expanded wharf is 1,510m, and the water depth is 19m to 29.5m. Two berths will be constructed with lengths of 390m and 350m respectively.
The cruise terminal is expanded to the south, with two berthing locations, which can accommodate modern cruise ships over 280m in length. I2QS signed a contract to provide infrastructure design and consulting services for port expansion.
In terms of container freight volume, the port is the 32nd largest port in the world. The container terminal began operations in June 2010, with an estimated annual capacity of 1 million TEUs, which can provide advanced container handling services. The container terminal includes 7 gantry cranes, 8 rail-mounted gantry cranes, 1 mobile crane and other mechanical equipment. (Ship-technology)

3.4.3 Green Measure

In 2016, the city of Piraeus joined the Climate and Energy Mayors' Pact, which adopted the EU's 2030 targets for climate change mitigation and adaptation. (PPA 2019) Regarding the environmental sector, Piraeus Port Authority (PPA) gives great importance on the protection of the environment and the promotion of sustainable solutions which meet the general vision of the port to be transformed into a “green” port. The PPA master plan includes environmental infrastructure projects and upgrading environmental actions, which cover the following sectors: waste, energy, green technologies, photovoltaic, plants and emissions. (PPA 2019)

Priorities of PPA policy are the effective management of waste generated from port installations and ships, monitoring noise quality, in the entire port area, Passenger and Commercial terminals and monitoring air quality at the Passenger and Cruise Terminals. PPA is also environmentally sensitive and aware of all the environmental issues related to the development/expansion plans and works (current and future), the coastal resources and the need to monitor the adverse effects in the environment from ships, private companies and contractors that are facilitated and activated within the port area.

The PPA develops and implements an environmental policy that takes into account European and national environmental legislation as well as international environmental regulations, while it devises a specific mechanism to assess the environmental performance of port activities. PPA implements advanced levels of organizational and environmental management through the following actions:
Environmental Management Standards
Environmental Quality Monitoring Program
Ship-generated waste management plan
Marine Pollution Preparedness and Response Contingency Plan (PPA 2019)

Instead, the PPA focuses specifically on the following environmental issues: Figure 2.1: Piraeus Port Environmental Operations: Seawater Quality, Noise Quality, Air Quality, Landscape, Energy Management, On-shore generated Waste Management, Marine Pollution Preparedness and Response Contingency Plan, Ship generated Waste Management Plan.

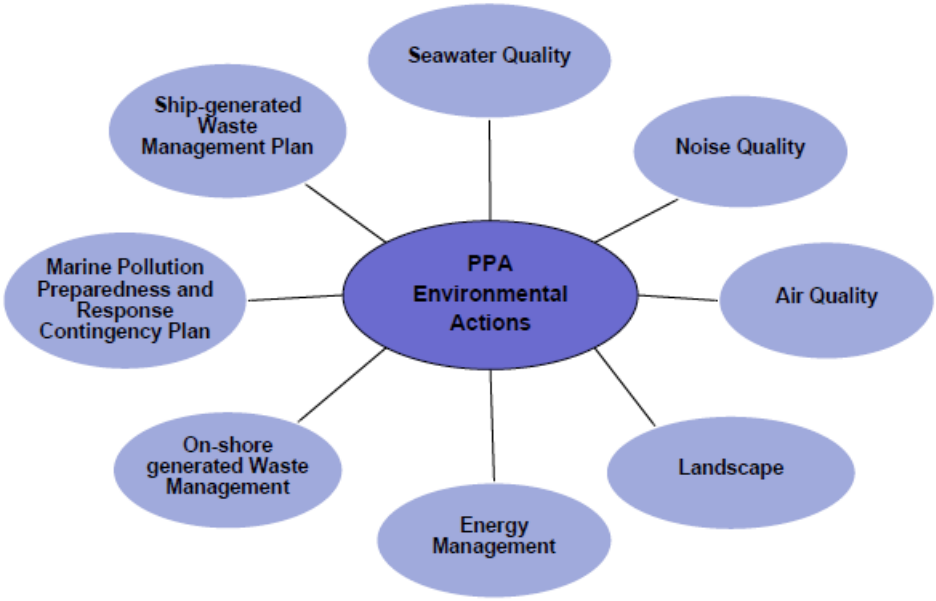

Figure 31: Piraeus Port Environmental Operations, Source: Action Plan for a Sustainable and Low-carbon Port of Piraeus (PPA 2019)

Technical Data of Piraeus Port	
Owned by	China Ocean Shipping Company (67%); HRADF (7.14%); Non-institutional investors (25.86%)
Cooperation Start Year:	2008
Location	Piraeus, Greece
Site Area	39,000,000 m²
Storage Area of Cargo Terminal	72,400 m²
Typology	Port
Container Quay Length	1150 m
Berth Depth	18 m

Figure 32: Technical Data of Piraeus Port, Data Source: https://www.piraeus.org/the-port.html (drawn by author)

	Colomo Port City	Djibouti International Free Trade Zone		Piraeus Port
Location	Colombo, Sri Lanka, Southeast Asia	Djibouti, Republic of Djibouti, Africa		Piraeus, Greece, Europe
Name of Project	Port City of Colombo (PCC)	Djibouti International Free Trade Zone (DIFTZ)	Doraleh Multi- purpose Port (DMP)	Doraleh Container Terminal (DCT)	Piraeus Port
Owner	China Communications Construction Company (CCCC); Sri Lanka Authority	China Merchants Port Holdings Co., Ltd.(85%); Sri Lanka Port Authority holds 15%	DPFZA; China Merchants Group; Dalian Port Authority; IZP Group	China Merchants Group; DP World	China Merchants Group; DP World	China Ocean Shipping Company (67%); HRADF (7.14%); Non-institutional investors (25.86%)
Cooperation Year	2014	2008	2017			2008
Typology	Special Economic Zone	Container Terminal	Free Trade Zone	Port	Container Terminal	Port
Advantages after Cooperation	Positive impact on Sri Lanka's economic development, improvement of people's livelihood, and improvement of the Colombo local	Due to takeover by the CMPH, CICT's transportation volume in 2018 increased by 13% compared with the previous year	Could become to Africa's largest FTZ, providing specialized logistics, retail, commercial support and processing facilities	Relieved congestion at the former port of Doraleh inaugurated; waiting time to discharge goods was reduced from weeks to days	Leveraged the geographical strategic opportunity and to diversify its port operations.	Jumped from the 93rd in 2010 to the 38th busiest container port in the world; the port's throughput increased by about 7 times; reduced transportation costs
Social Sustainability	Provide a lot of employment opportunities for local in construction phases and future	Brought economic growth to the local area as well as guaranteed income for local employees in CICT	Total about 350,000 anticipate employment opportunities			Create lots of jobs; help strengthen the cruise shipping and tourism industry
Environmental Sustainability	Environmentally sustainable designs are used:planning different sizes of green areas in different density district, installation renewable energy, green roofs and the concept of urban rainwater harvesting system, etc.	Convert the company's diesel-operated rubber-tyred gantry cranes to electric-powered rubber-tyred gantry cranes or E-RTGs, and more than 80% of electric power generated using solar power sources	Except to a detailed assessment of the environmental and social impacts of the project from the African Development Fund, projects lack of technologies related to sustainable green terminals			More environmental infrastructure projects and upgrading environmental actions, covering: waste, energy, photovoltaic, plants, emission

Figure 33: Comparison of 3 Cases (drawn by author)

Chapter 4: Conclusion

Since the BRI was proposed till now, BRI has become the most extensive and largest international cooperation platform in the world. Countries in Asia, Africa and Europe have all been deeply influenced by it. As one of the world's largest economies, China plays a very important role in international trade, and it still maintains a relatively considerable GDP growth rate against the backdrop of a sluggish global economy. Therefore, cooperating with BRI to build free trade zones or related transportation network infrastructure is an opportunity for many countries to develop their economies. Due to the general trend of globalization and from a sustainable perspective, the strengthening of economic and trade cooperation among countries advocated by BRI will undoubtedly have a positive impact on the sustainable development of the world's society and economy. The concept of sustainability is consisted of three major pillars, the economy, environment and society, which have different characteristics, targets and perspectives. The environmental pillar is focused on reduction of carbon footprint, energy consumption and waste; the economic pillar includes the governance, compliance and risk management to ensure that the organization is profitable; and the social pillar is associated with the support and approval of the employees, relevant stakeholders and local community.

Free trade zone (which can be regarded as one of the node types of BRI's transportation network) is one of the most important types of projects invested by BRI. It usually includes functions such as warehousing, storage, distribution facilities for trade, transshipment, and re-export operations. Therefore, in order to geographical advantages for trade, FTZs are generally organized around major ports. As said at the beginning of Chapter 2, there are usually a lot of carbon emissions and environmental pollution problems in the transportation work in large deep-water ports, such as: a large number of energy consumption, the use of fuel as a power source, the emission of a large amount of carbon dioxide and even polluting gases, the problem of underwater noise and the reduction of marine biodiversity. However, many environmentally sustainable advanced technologies have been introduced in the design of modern cruise ships, ports and container terminals, such as Alternative Clean Fuels, LNG Bunkering Facilities, Shore Power, technologies relate to reduce Underwater Noise Levels, as well as some international measures to control emission standards mentioned in 2.4.1. These can be used as the basis for us to draw the conclusion that BRI can achieve environmentally sustainable development in the construction of FTZ. Of course, with the technical support of various sustainable ports, we also need to use cases to understand whether the BRI free trade zone projects really pay attention to and utilize them to achieve sustainable development goals, and to understand the assessment of the specific local conditions of the Port of Venice.

4.1 Sustainability in 3 Case Studies

In the Chapter 3, in the research on the 3 FTZ projects in cooperation with BRI, namely Colombo Port City (Sri Lanka), Djibouti International Free Trade Zone (Republic of Djibouti), and Piraeus Port (Greece), as for whether their design and construction are concerned with and operated sustainable to a certain extent, I draw conclusions separately in chapter 4.1.
The sustainability of construction projects should be assessed from 3 dimensions: Environment, Society, and Economy. Therefore, the sustainability of the 3 free trade ports I mentioned above will

draw conclusions from these three aspects. And what kind of inspiration and reference can each case bring to the sustainable cooperation between Venice and BRI.

4.1.1 Sustainability of PCC & CICT

Sri Lanka is in a very important position in terms of transportation and has great potential for development in the international trade market. However, due to historical and political and other related reasons, there are difficulties in the construction of infrastructure and urban modernization with the Sri Lankan government. The cooperation with BRI can improve Colombo's infrastructure and a lot of economic benefits, so this is an advantage for its social and economic sustainable development.

From the previous introduction, it can be seen that some environmentally sustainable designs are used in the PCC general plan, such as: technology in the reclamation project, planning different sizes of green areas in different density district, installation renewable energy, green roofs and the concept of urban rainwater harvesting system, etc.
As for the society and economy, not only for future development but also for the initial projects already completed and underway, PCC provides a lot of employment opportunities for local. And once such a large and great Port City project is completed, the economic benefits for local and foreign investors will be enormous. Therefore, PCC is expected to improve Sri Lanka's infrastructure construction, expand employment and promote local economic development. But no matter what the planning is, at present PCC is just an unfinished urban construction project, and only the initial projects that have been completed can be used as the most accurate reference.

At the same time, due to takeover by the Chinese company (CMPH), CICT's transportation volume in 2018 increased by 13% compared with the previous year, reaching 2.65 million TEUS. This has brought economic growth to the local area as well as guaranteed income for CICT employees. In addition to these economic and social sustainability, CICT is also doing very well for environmental sustainability. As mentioned in 3.2.4, the relevant technologies and measures used by CICT in green terminals are: convert the company’s diesel-operated rubber-tyred gantry cranes to electric-powered rubber-tyred gantry cranes or E-RTGs, and more than 80% of electric power generated using solar power sources. It created a case for green policies in port operations.
To sum up, we can believe that the current PCC project is a relatively sustainable project, and CICT can be called an excellent case in sustainable ports, whether in terms of society, economy or environment.

4.1.2 Sustainability of DIFTZ & DMP & DCT

Djibouti is strategically located on the Bab el-Mandeb strait, a chokepoint between the Red Sea and the Gulf of Aden. While Djibouti’s economy depends heavily on trade through its busy international port complex, and profits from shipping and land leases are important revenue sources for the government. The DIFTZ general project, the partnership with BRI and funded by China, will allow the government to transform itself into a commercial and trade hub in the Horn of Africa region. This work represents a growing influence for BRI in Djibouti.

The project has brought a huge job market to the local area. At the same time, it also brings considerable economic benefits in the current and future development. So it is socially and economically sustainable. However, in this project and its related DMP and DCT projects, it is difficult to see the related information of sustainable green technologies, and more emphasis is placed on the carrying capacity of ports or container terminals. It may be because the Djibouti authorities do not have any formal legislation on environmental protection and requirements for port safety and security related matters, as well as the local lack of attention to environmental sustainability and the lack of local technology, so the emission reduction measures has not been deliberately implemented and used in projects. However, it can also be seen that in the early stage of DCT project planning, the African Development Fund made a detailed assessment of the impact of the project on the environment and society, and giving highly detailed solutions.

These cases illustrate that poor local construction conditions or local government neglect of environmental sustainability can lead to less-than-stellar sustainable low-carbon ports in FTZ projects with BRI. This has a warning effect on the cooperation of the Port of Venice. Of course, Italy, as a developed European country, is much more advanced in terms of sustainable port technology and has more complete environmental regulations, and the shortcomings in Djibouti's projects are easy to avoid.

4.1.3 Sustainability of Piraeus Port

The expansion and improvement projects of the port in cooperation with BRI has brought considerable benefits to Greece, as well as increase income and economic flow by creating new employment opportunities and increasing tourism. The improvement of the port will support the country’s economic growth, and help strengthen the cruise shipping and tourism industry and reduce transportation costs. The overall plan includes future development plans and measures to improve the competitiveness of the terminal. These are the project's active support for environmental and social balance in order to achieve sustainable development goals.
Regarding the environmental sector, Piraeus Port Authority (PPA) gives great importance on the protection of the environment and the promotion of sustainable solutions which meet the general vision of the port to be transformed into a green port.

In fact, PPA has made some efforts to reduce the port's impact on the environment, such as monitoring and controlling the sea water, air quality and noise indicators near the port every year. Taking into account European and national environmental legislation and international environmental regulations, an environmental policy has been developed, and it has designed a specific mechanism for the evaluation of the environmental performance of port activities. These policies and mechanisms help to control and supervise the expansion and improvement projects and operations of the port, and are the basis for all measures that can effectively reduce environmental impacts. This is a measure worthy of reference and study. Maybe because Piraeus Port is an early development port with a lot of previous infrastructure, it cannot be said that it has done a good job in low-carbon ports, but both PPA and China Ocean Shipping Company are closely following. The global demand for sustainable green ports has led to control and adjustment measures for carbon emissions in various port sectors. The same is true for the Port of Venice, which is also have some infrastructure with high emissions, so this case provides an example of how to control its impact on the environment by developing a more stringent

performance evaluation mechanism in this situation.

4.2 Port of Venice

As stated in the last part of Chapter 1.4, The transition between China and Italy started on the ancient Silk Road. The “Belt and Road” initiative has become a new opportunity for Sino-Italian exchanges in the new era. The history that Italy should seize opportunities, actively share the fruits of China's development, and ease the domestic economic recession. China and Italy recognize the Belt and Road Initiative. The initiative has great potential in promoting connectivity, and is willing to strengthen the connection between the "Belt and Road" initiative and the Pan-European Transport Network (TEN-T), and deepen cooperation in ports, logistics, shipping and other fields. In this field, the core focus is on the cooperation between Venetian Port Authority and China.

The Port System of the Northern Adriatic Sea, consisting of the ports of Venice and Chioggia, is strategically located at the apex of the Adriatic Sea at the intersection of two European transport corridors, Mediterranean and Baltic-Adriatic, and is the terminal of the Motorways of the Mediterranean Sea. Orientale that connect central Europe to Africa and the Middle East and terminal of the river course that crosses the Po Valley allowing for fluvio-maritime intermodality and balanced transport of goods by barge. (Porto-di-venizia n.d.)
The Veneto Port System has a specific multipurpose vocation, an aspect particularly present in the port of Venice and of extreme importance as, in a multifunctional port, no area prevails in a preponderant way, but the different sectors and supply chains are equally balanced.
The Port of Venice, in particular, works and interacts with various supply chains (agri-food, steel, chemical, energy), as well as commercial and tourist ones, not only in Veneto but also in Northern Italy. By analyzing the entire port system, and therefore also including the Port of Chioggia, the fishing industry is also involved. With respect to the sphere of influence in terms of flows and activated relationships, these are in support of the regional entrepreneurial fabric and more generally of the entire Northeast. (Porto-di-venizia n.d.)

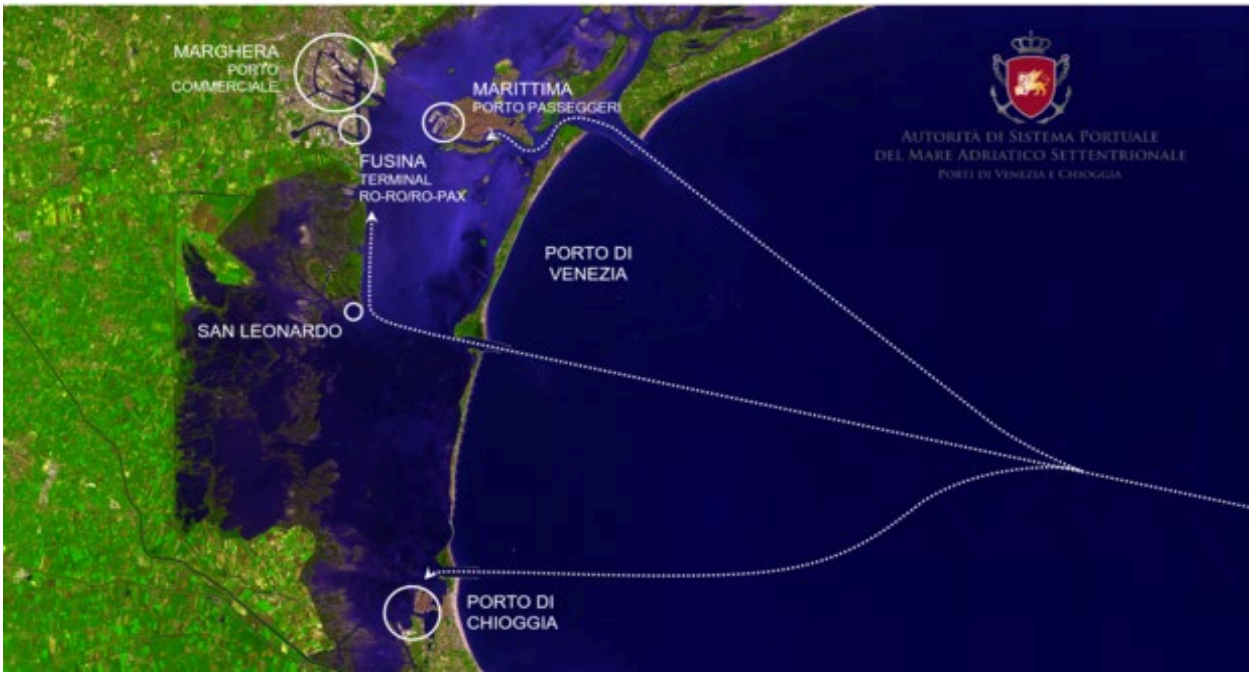

Figure 34: Port of Venice's Location and its Members, Source: https://www.port.venice.it/it/node/345

4.2.1 How Venice Port to sustainable

From the content in Chapter 1.4, it can be seen that the cooperation between Venice and BRI is based on historical politics and the need for economic development as the driving force. The participation of BRI is expected to make the Port of Venice busy again. But since the city of Venice is a World Heritage Site, large port activity could have a negative impact on its lagoon. Therefore, BRI's requirements for environmental sustainability in developing a free trade port here will definitely have higher requirements than other ports. Then according to the green port technologies that reduce environmental impact mentioned in Chapter 2: a large number of energy consumption, the use of fuel as a power source, the emission of a large amount of carbon dioxide and even polluting gases, the problem of underwater noise, the reduction of marine biodiversity, and the case study in Chapter 3, we can draw a conclusion, that sustainability of the cooperation between the Port of Venice and BRI is feasible.

First of all, we should be sure that whatever a project talks about its sustainability will be depend on local, it need to focus on identifying the synergies and conflicts among the selected indicators, in order to reach the main goal of the Action Plan, which is to transform Port of Venice into a sustainable port in terms of social, environmental and economic.
Such as the Djibouti case we studied above, there is an action may have a very positive impact on the environment, yet its implementation costs are enormous. The approach used to identify action plan measures aimed at balancing conflicting economic, environmental and social factors and enhancing synergies, taking into account the Venice Port Authority's priorities, needs and objectives identified during the focus group and relevant stakeholders meet.

The Port of Venice has been working hard to demonstrate that it is possible to combine sustainability and development in the port in terms of traffic volume and prosperity, as well as lagoon, habitat and environmental protection or community well-being. The focus is on improving air quality, protecting the Venetian Lagoon, re-certifying the port area, alternative fuels (electric, LNG, hybrid) and reducing energy consumption.

Based on the content of Chapter 2, I believe that the green technologies that the Port of Venice needs and can improve are: LNG bunkering facilities, shore power, and technologies related to reducing underwater noise levels. Because for Venice, the advantages of reducing energy consumption and carbon emissions in the later period brought by these technologies can be higher than the initial investment. The former two can mainly reduce the use of unclean energy and reduce greenhouse gas emissions, while the latter mainly maintain the ecological and built environment of the lagoon.

PPC and CICT are the best examples of these three in terms of sustainability and environmental impact control, and the Port of Venice can learn a lot from the experience of green port technology and infrastructure construction. What the Port of Venice needs and can learn from: Convert the company's diesel-operated rubber-tyred gantry cranes to electric-powered rubber-tyred gantry cranes or E-RTGs; Most of electric power generated is using solar power sources, which can greatly reduce Greenhouse gas and carbon dioxide emissions from port lifting equipment.

In the DIFTZ, DMP and DCT projects, the measures related to environmental sustainability are rarely mentioned, only the investigation of relevant departments in Africa and the requirements of environmental protection measures in the early stage of construction. It is far inferior to the first case in terms of equipment and facilities. There is only a reminder here for the Venetian port that both local technology and the environment need to be controlled by a stricter standard.

Piraeus Port is the closest case to the Port of Venice. They are both located in different waters of the Mediterranean Sea. They are both the main ports entering Europe, and they are all large ports with a long history. They all play an important role in the trade and economy of their countries. In this case, the Port of Venice can learn how to control its impact on the environment by developing a more stringent performance evaluation mechanism as a time-honored port.

Within this framework, the Port of Venice benefits from several European projects related to these issues, investing in refining and developing tools to facilitate CO_2 reduction at sea and onshore. In addition, they encourage entrepreneurial initiatives aimed at enabling the energy transition, stimulating a circular economy and improving air, water and soil quality. The Port of Venice should adopt a "three-step strategy" on its path to environmental sustainability: first to reduce energy demand, then to further technological improvements, and finally to adopt renewable energy. Committed to the vision of maintaining a modern multi-purpose port while promoting the goal of being a low carbon port.

In order to protect the original historical heritage in the Venetian Lagoon, the above measures seem to be difficult to solve the fundamental problem. This seems to be a problem that can only be completely solved by preventing large ships from docking in this area. But in fact, Venice has another special concept system called Venice Onshore Offshore Port System (VOOPS), which aims to achieve the purpose of allowing large cargo ships to work in ports in the area without entering the interior of the lagoon. This concept, initiated for the BRI, once completed, will be very effective in addressing issues affecting the environment of the Venetian Lagoon caused by port work.

4.2.2 Venice Onshore Offshore Port System (VOOPS)

The marine terminal at the Port of Venice is a project capable of turning legal obligations into growth levers and physical constraints into opportunities, in fact: The Venice Conservation Act (1.798/84) requires the exclusion of tankers from the lagoon; The Port of Venice will have marine accessibility restrictions when the MoSE system (Modulo Sperimentale Elettromeccanico, Experimental Electromechanical Module) is put into operation, which is designed to protect the city from high water impacts.
The marine terminal goes beyond legal obligations and access restrictions by linking the construction of the Highland Oil Terminal with the construction of the container terminal. Offshore terminals are highly innovative and strategic "port machines" for the development of Venice.

VOOPS, the Venetian Onshore Offshore Port System, consists of an integrated multimodal transport infrastructure for transoceanic ships, located near the Venetian Lagoon and designed to recreate the old "Silk Road". The Venice Port Authority is planning an offshore platform to expand its capabilities and strengthen the role of the North Adriatic Sea as a gateway to Europe. The project is located in a

competitive port base, which can effectively connect with the market and is an important link between export and economic development. VOOPS is designed to serve at least four onshore terminals simultaneously. Via Venice (Porto Marghera), Chioggia, Mantova and Port Levante, the project can expand the traffic volume generated and exploit all the potential of the infrastructure (existing and future) to embrace the integration of the northeast. water area to the whole of Central and Eastern Europe.

Figure 35: VOOPS's Service Object, Source: https://www.3tiprogetti.it/project/new-off-shore-multimodal-terminal-in-venice/

The offshore platform, located 8 miles offshore with a seafloor depth of at least 20 meters, will be protected by a 4.0-kilometer long breakwater dam that will protect an oil terminal and a container terminal that can accommodate up to three vessels The latest generation of container ships at the same time. The marine terminal near the Port of Venice will berth larger ships and will bring economic and environmental benefits. Due to its unique location, the design of the project is particularly influenced by the delicate environmental balance of the lagoon, where the design guiding principles are subtly

intertwined. In order to maintain the above conditions, the infrastructure uses a separate stormwater network and industrial sewer network. The collected rubbish is dispersed into the sea after specific treatment procedures and purification. Monitor biological and contamination-related parameters to reduce effective effects on the system. (3ti-progetti n.d.)

8 achievable goals

(1) Extraction of oil from the Venetian Lagoon for transportation in accordance with the provisions of Law No. 798 of November 29, 1984 (Article 3 Letter I). The goal that the marine terminal can finally meet.

(2) maintain the nautical accessibility of the Port of Venice. When the MoSE system comes into operation, the vessel may have to use the Malamocco navigation lock to enter and exit the lagoon. The marine terminal guarantees nautical accessibility for ships of all sizes.

(3) Contribute to the restoration of former industrial waste areas. Marine terminals for port and logistics purposes will facilitate the development of other coastal port areas, as well as repurpose existing infrastructure assets that are currently underutilized.

(4) Reduce the undue "logistics tax" that burdens the Italian production system and provide a port base for the Northeast logistics system centered on excellence. A large part of Northeast trade is "diverted" and handled by North Sea ports.

(5) The internal novigation system along the Po river and the connected canal are valued, offering through the ports of Venice, Chioggia, Porto Levante and the internal river port of Montova, other possible points of sea / river and river / land exchange. The Po waterway system will thus be able to act as a link between the Po Valley and the oceanic deadening services, as is the case with the Flanders waterway system in the port of Anverso.

(6) as a refuge in the Upper Adriatic. In adverse marine weather conditions or emergencies, marine piers can be a reference point to ensure a safe landing of ships.

(7) In cooperation with other ports of NAPA (North Adriatic Ports Association), guarantee to be able to demonstrate the volume of traffic from the Mediterranean to Central and Eastern Europe, in line with the European policy of establishing a basic TEN-T network, which has chosen Alto Adriatico for more The port acts as a port root for the Adriatic-Baltic, Mediterranean and Helsinki-Valletta corridors.

(8) Provides a transit port for Italian ports where even the largest container ships can call-up to 18,000 TEU now and more than 20,000 TEU in the future.

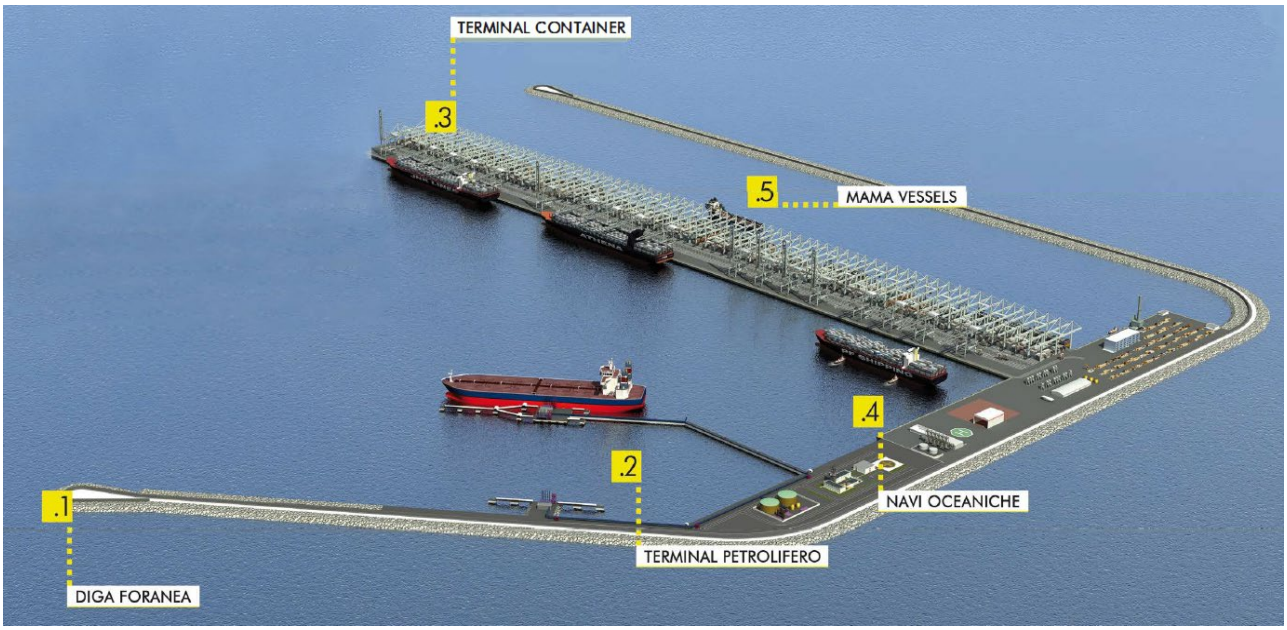

Figure 36: VOOPS Concept Renderings, Source: https://www.3tiprogetti.it/project/new-off-shore-multimodal-terminal-in-venice/

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