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THE ROLE OF INTERMODAL TERMINAL IN LOGISTICS AND PROPOSAL FOR INTERMODAL TERMINAL IN ISTANBUL, TURKEY

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Abstract

The role of logistics process in calling the world as global village is a lot. Logistics as a growing structure is directly proportional to the consumption. World trade volume increased to 16 trillion dollar and logistics volume reached to 6.4 trillion dollar. So 40 percent of the trade volume consists of logistic activities. Turkey has a location within 600 billion worth of goods movement. Surrounded on three sides by the sea, connecting Asia and Europe and by its important role in Black Sea and the Mediterranean Sea, Turkey is in a situation to be a centre for logistics activities. In 2023 Turkey has set a target goal to make Istanbul a center of logistics. In order to undertake this mission Turkey must strengthen the intermodal transport network and intermodal terminals. This article is a survey on intermodal transportation and their modes; a detailed investigation on worldwide transportation corridors in intermodal network. At the same time this article is an investigation about intermodal terminals which are highly used as main ports and statistics information are comparing with each other. Turkey's and World's logistics information are studied in detail. According to this research, In Turkey especially in Istanbul there is a need for intermodal terminal which is offered in this article. Finally, the location of this intermodal terminal was determined and it is explained why this location was selected.

Key words: Intermodal terminal, Corridors, Logistics, Transportation, Istanbul- Turkey

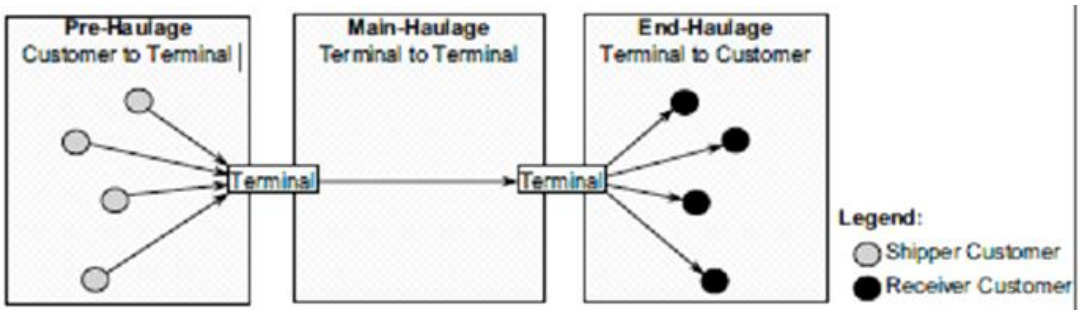
INTRODUCTION

Intermodal transportation is a term to explain the connection of two or more transportation types which work together in order to freight a cargo from origin to the last user which is at the destination. This procedure initially started by containers (Novack, 2006). The critical factors for intermodal operators and companies is point-to-point bundling concept which should be affordable trustworthy. Point-to-point bundling is a procedure in which the cargo that is load at the origin on the train totally goes to destination point (Bontekoning, 2006).

According to combined transport technology have prepared with the of The United Nations Economic Commission for Europe (UNECE or ECE), European Conference of Ministers of Transport (ECMT) and European Commission (EC) intermodal transportation is kind of transportation without classification, same loading unit (for example container) and two or more than transportation modes (UNECE, 2001).

Intermodal transportation has three levels; first is pre-haulage, second is main-haulage and last one is end-haulage which refers to first step customer to terminal, second terminal to terminal and terminal to customer (Table1).

Table 1. Intermodal Freight Transportation



Source: Nossack (2013)

Container

The improvement of the intermodalism is because of developing entrance of containers. Malcolm McLean is a successful truck line owner, he create the fact of using a trailer to freight by both highway and seaways in the mid-1950s. He is created the operation improved and at the end it became to be one of the largest seaways carriers (Coyle, 2010).

The most important role in intermodal transportation development was the role of containers. Container is a kind of transportation unit that different kinds of goods could be load on it facilitates the transferring job between different transportation types and this procedure is a time and money saving. Also safe load and discharge is another advantages of this procedure. Container causes radical changes in world marine sector. For example in traditional discharge

system discharging 40.000 tons needs 24.000 man/time but container ships needs 750 man/time for discharging the same amount. Previously ships waits for discharge 25 days, this period decreased just two days by the use of containers (Slack, 2001).

Container Usage

Intermodal is a transportation mode which includes two or more different kinds of shipping types. When goods from one to another type of transportation the risk of damaging and loss would happen, also more time would be waste. Main challenge is to minimize the transit time. The company has to manage handling cost in order to decreased transportation cost. That why using container is essential.

In order to minimize waiting time the usage of same containers is preferred, this is one of the updated technology which is newly founded to standardize transportation. In addition companies prefer systematic transfer firstly; they use trailers in order to transfer cargos. This is going to be very safe and fast from a truck to the train. Suitable ways to ensure the security of goods are containers. The only difficulty is the weight of containers which are hard to be transported. The rail containers are lighter than sea containers these two forms usually come together with road transportation. After that to transfer the cargo between two modes the carriers are used two develop the activity. Even in some cases the whole truck is transported by train (Gourdin, 2010). Table 2 refers to container traffic volumes of top 20 countries in 2010. The highest numbers of container exist in China. The next one is United States with the amount of 38.5 million TEU which is less than half amount of China.

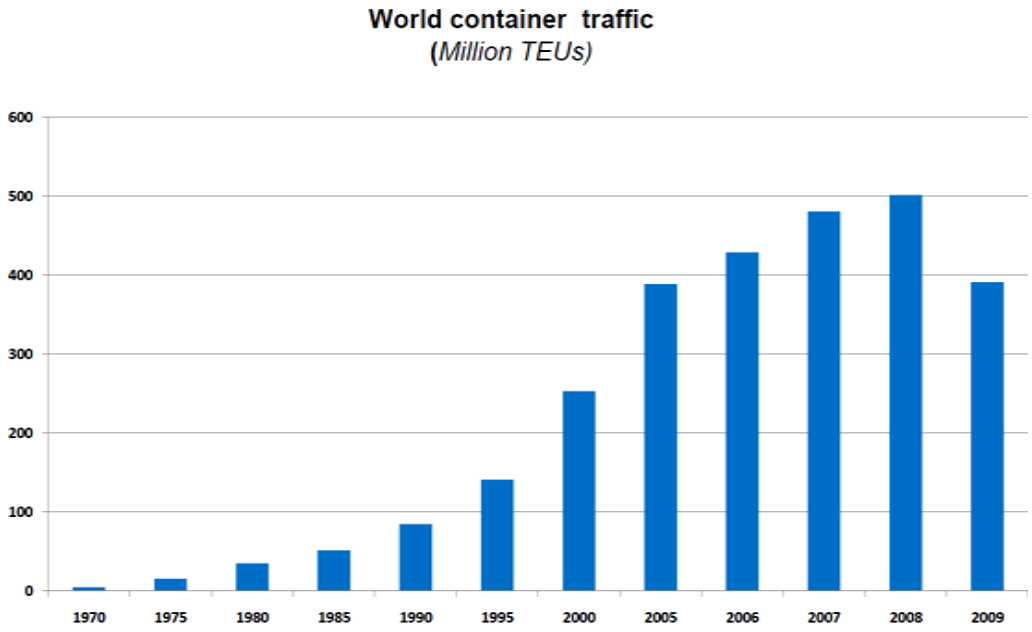
Table 2. Container Traffic Volumes

Rank	Country	Amount	Rank	Country	Amount
1	China	88,548,470 TEU	11	Spain	9,170,109 TEU
2	United States	38,519,040 TEU	12	United Kingdom	8,598,891 TEU
3	Singapore	23,192,200 TEU	13	Belgium	7,889,994 TEU
4	Japan	16,777,410 TEU	14	Brazil	5,598,110 TEU
5	Korea	15,113,280 TEU	15	Indonesia	5,503,176 TEU
6	Germany	13,507,040 TEU	16	Thailand	5,115,213 TEU
7	Malaysia	12,027,050 TEU	17	India	4,938,226 TEU
8	Italy	9,855,451 TEU	18	Australia	4,830,254 TEU
9	UAE	9,845,930 TEU	19	Canada	4,163,424 TEU
10	Netherlands	9,520,844 TEU	20	France	3,839,739 TEU

Source: Hyuk-soo CHO, Kun-woo YANG, 2011

Figure 1 refers to world container traffics yearly (million TEUs). The crisis in 2009 is obviously found in figure 1. The highest amount of world container traffic was 500 million TEU till 2009.

Figure 1. World container traffic rates



Source: ISL Shipping Statistics and Market Review; 2012

Intermodal Transport Unit (ITU)

Intermodal transport unit (ITU) is a term that defines different types of units that load goods. The ITUs parts are containers, swap bodies, semi-trailers and roll-on frame. The other transportation types are: Unaccompanied Transport, Rolling Road (Ro-La), Accompanied Combined Transport, Roll On, Roll Off (Ro-Ro) Shipping, Piggyback Transportation, Bi-Modal Transportation-Roadrailer, Train Ferry Transportation and Lift-On/Lift-Off (Lo/Lo).

INTERMODAL TRANSPORTATION NETWORK

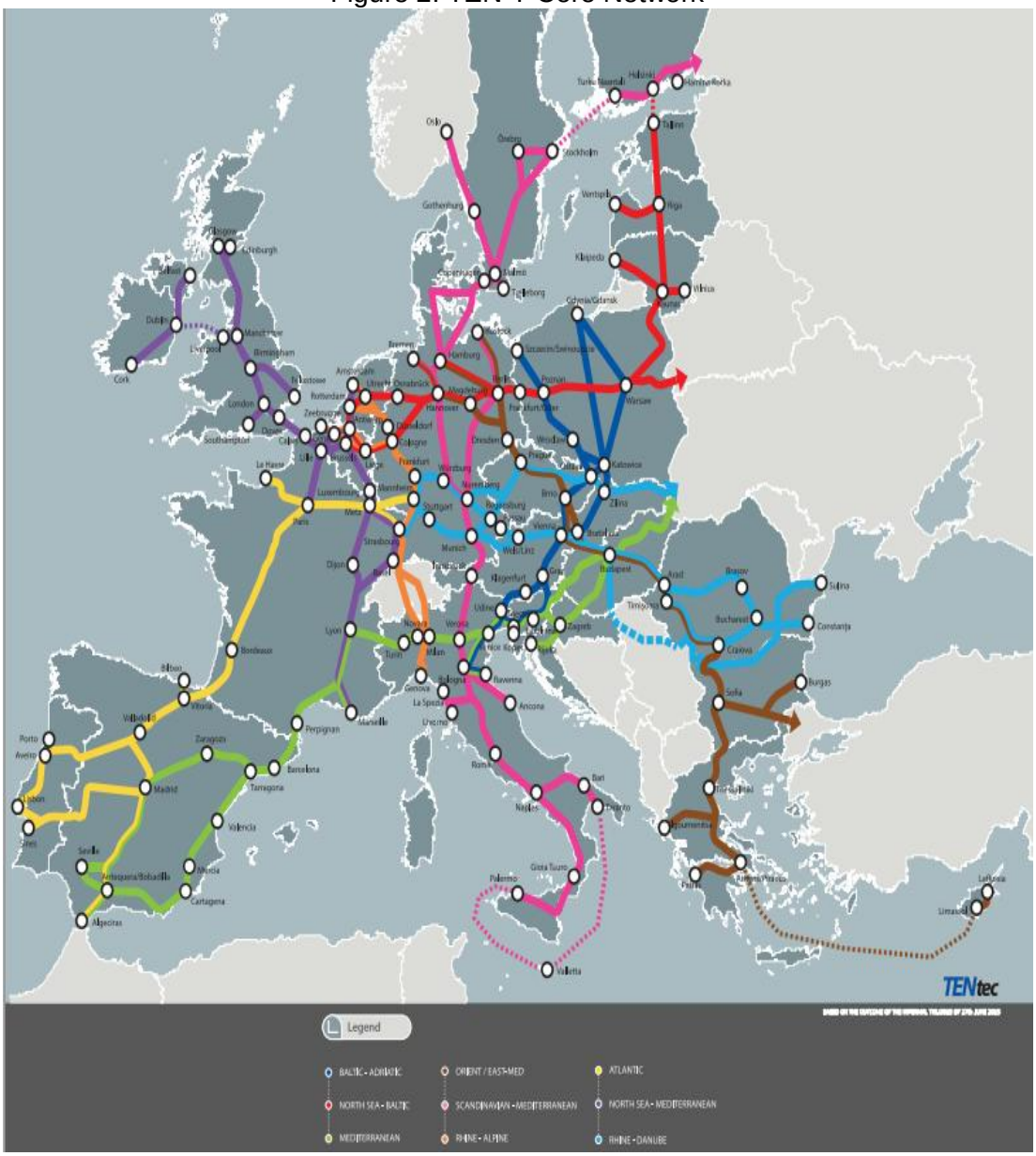
Trans-European Transport Networks (Ten-T)

In 2013 the Trans-European transport network (TEN-T) new legal basis was accepted. It includes transport infrastructure policy in Europe. some researchers has been done regarding the combined multi-modal network in the past 20 years, accordingly combined multi-modal network shows the main innovation of the new TEN-T policy. Until 2030 this network should be improved. Trans-European transport network (TEN-T) connects main points through rail, road, inland waterway, maritime and air transport connections. (European Commission, The Core Network Corridors Progress Report; 2014).

Corridors

There are 9 corridors includes different kind of projects that are eligible to get EU funding in the period of 2014 and 2020. These projects are according to Connecting Europe Facility (CEF) regulation they are as added value of TEN-T and factor that develop it. These corridors are: Scandinavian-Mediterranean corridors, The North Sea-Baltic Corridor, The North Sea-Mediterranean Corridor, Baltic-Adriatic corridor, The Orient/East-Med Corridor, The Rhine-Alpine Corridor, The Atlantic Rail Corridor, The Rhine-Danube Corridor and The Mediterranean Corridor. Figure 2 refers to all of corridors for TEN-T networks.

Figure 2. TEN-T Core Network



Source: http://ec.europa.eu/

Pan-European Transportation Network

Three Pan-European Transport conferences have been talked about Pan-European Transport Network and improved it. The first Pan-European Transport conference was held in Prague in 1991. The concept for transport infrastructure was agreed in this conference. The second Pan-European Transport conference was held in 1994 in Crete. In this conference they discussed about infrastructure improvement for the countries of Western, Central and Eastern Europe. Also nine long distance transport corridors were mentioned. Third Pan-European Transport conference was about tenth corridor and the Pan-European Transport Areas for maritime basins were added. This conference was held in Helsinki in June 1997. Overview over the Corridors:

Table 3. Pan-European Corridors

	Length (in km)
Corridor I: Tallinn – Riga – Kaunas – Warszawa Branch: Riga – Kaliningrad – Gdansk	
Rail	1,655
Road	1,630
Corridor II: Berlin – Warszawa – Minsk – Moskva – Niznij Novgorod	
Rail	2,313
Road	2,200
Corridor III: Dresden – Wroclaw – Lviv – Kiev Branch: Berlin – Wroclaw	
Rail	1,650
Road	1,700
Corridor IV: Dresden – Praha – Bratislava/Wien – Budapest – Arad Branch: Nürnberg – Praha Branch: Arad – Bucuresti – Constanta Branch: Arad – Sofija – Istanbul Branch: Sofija – Thessaloniki	
Rail	4,340
Road	3,640
Corridor V: Venezia – Trieste/Koper – Ljubljana – Budapest – Uzgorod – Lviv Branch: Rijeka – Zagreb – Budapest Branch: Ploce – Sarajevo – Budapest Branch: Bratislava – Zilina – Uzgorod	
Rail	3,270
Road	2,850
Corridor VI: Gdansk – Grudziadz/Warszawa – Katowice – Zilina Branch: Grudziadz – Poznan Branch: Katowice – Ostrava – Breclav/Brno	
Rail	1,800
Road	1,880
Corridor VII: Danube	2,415
Corridor VIII: Durres – Tirana – Skopje – Sofija – Varna/Burgas	
Rail	1,270
Road	960
Corridor IX: Helsinki – St. Petersburg – Pskov/Moskva – Kiev – Ljubasevka – Chisinau – Bucuresti – Alexandroupolis Branch: Klaipeda/Kaliningrad – Vilnius – Minsk – Kiev Branch: Ljubasevka – Odessa	
Rail	6,500
Road	5,820
Corridor X: Salzburg – Ljubljana – Zagreb – Beograd – Nis – Skopje – Veles – Thessaloniki Branch: Graz – Maribor – Zagreb Branch: Budapest – Novi Sad – Beograd Branch: Nis – Sofija Branch: Veles – Florina	
Rail	2,528
Road	2,300

Source: the details taken from European Commission

Mediterranean and Trans-European Networks for Transport (Meda Ten-T)

One of the critical facts that improve Euro Mediterranean transport network, Mediterranean Partners and Trans European transport network is MEDA TEN-T. In order to accomplish this action there should be a plan for future. In this procedure existing network should be a specified and link to Mediterranean countries. (NESTEAR, MEDA TEN-T – Final Report; 2006).

Asian Highway Network

Asian Highway project has started to respond the demand of trustworthy and effective road transportation network and services in the Asian Pacific region. This highway is 140.000 km which is among 32 countries. All this organization is managed by UNESCAP. The Asian Highway Network was officialized by a contract between governments of the 20 countries. In 2006 the number of countries increased to 28 (ESCAP, 2006).

Trans-Asian Railway (Tar)

Back in 1960 The Trans-Asian Railway (TAR) project launched its activity by supporting a continuous 14.000 km rail link which is a connection between Singapore and Istanbul (Turkey) and planning to be a connection to Europe and Africa. This connection provided: shorting long distances, improvement in trade, economic growth and sustainability transportation. United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) has done Trans Asian railway (TAR) project to in order to make integrated freight railway network across Europe and Asia.

Transport Corridor Europe – Caucasus – Asia (Traceca)

The Transport Corridor Europe-Caucasus-Asia project was started in 1998 signed by EU and 14 other countries. This project includes connection between EU countries and Southeast Europe, South Caucasus and Central Asia. TRACECA has Dostyk-Tashkent-Ashgabat-Turkmenbashi-Baku-Tbilisi-Poti parts. Also it has ferry lines to Odessa, Varna, Constanta and Istanbul. There are a lot of technical assistance projects and a couple of financial support from routes in TRACECA (Evgeny Vinokurov; 2012).

Trans African Highways

The total length of this program is 59.100 km. Trans African Highways comprise of 9 main corridors. At first Trans African Highway was created in 1970s. The goal of this program is to build a connecting network of quality roads, these are;

a) To supply possible routes between the main city of the continent,

b) Contribute to the political, economic and social integration,

c) Provide resources for road transportation between significant point of production and consumption.

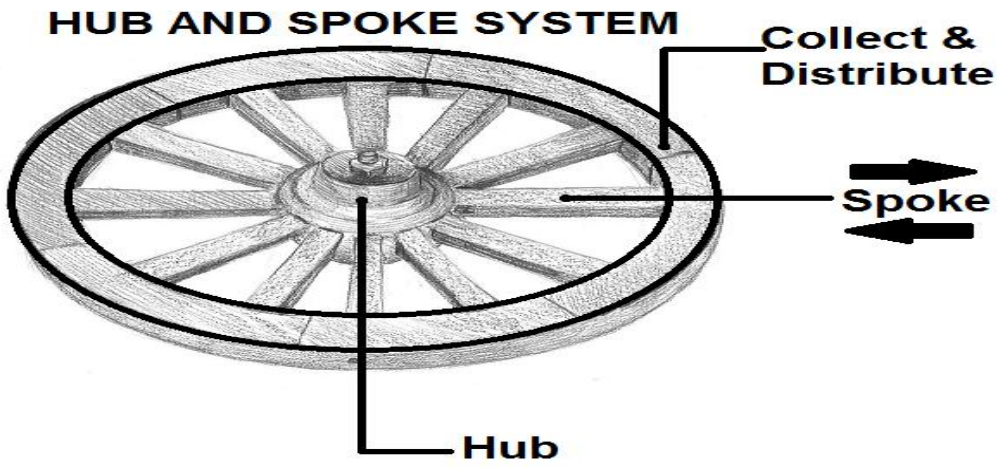
Table 4. Main Trans African Highways Length

ROUTE NUMBER	ROUTE	LENGTH (KM)
TAH1	CAIRO-DAKAR	8.636
TAH2	ALGIERS-LAGOS	4.504
TAH3	TRIPOLI-WINDHOEK-CAPE TOWN	9.610
TAH4	CAIRO-GABORONE-CAPE TOWN	8.860
TAH5	DAKAR-N'DJAMENA	4.500
TAH6	N'DJEMANA-DJIBOUTI	4.220
TAH7	DAKAR-LAGOS	4.760
TAH8	LAGOS-MOMBASA	6.260
TAH9	BEIRA-LOBITO	3.520
TAH10	DJIBOUTI-LIBREVILLE-BATA	7.600

Intermodal Hub and Spoke System

In distribution model of hub and spoke, the cargo for a vast area places in hub, accordingly it directs to a distribution center by spoke. That distributor holds the cargo of smaller region. The critical characteristic of hub and spoke is that it's close to the customer and it can service to lots of customers in a short time (Rahul V. Altekar, 2005).

Figure 3. Hub and Spoke Network



INTERMODAL TERMINALS

Intermodal terminals are the terminals that include two or more transportation types. These terminals which improve by containers are established in lots of different countries in the last 50 years. They also need variety of different equipments in order to connect transportation types together. The significant things of intermodal terminals are modes, modes connectivity and distribution of goods. The intermodal terminals should establish and develop infrastructure in order to present a good service.

In intermodal terminals the critical things is to choose a suitable location. Most important factor in global freight shipping chain is intermodal terminals. They support the connection not only between modes, but also between shippers and carriers. So the performance of those terminals should be carefully control and their performance was seen regarding to two main performance areas; customer service and operational efficiency.

Intermodal Terminals World Main Regions

As we know the biggest intermodal terminals in the world are container ports. After container was found, ports were growing up rapidly and costs decreased. In 1950s London and New York ports each employed more than 50.000 longshoremen. Containerization had impact of lowering the need for labor for port operations. For example, the number of employee in the Port of New York and New Jersey declined from 35,000 in the 1960s to about 3,500 in the 1990s.That is because of cost level reduced day by day. The following graph shows the biggest container ports and also level of Turkey/Ambarlı ports.

Ambarlı

Turkey's largest port, Ambarlı located in Istanbul. Annually 3.38 million TEU is handling at Ambarlı port which is world's 39th largest port. Ambarlı port is in European side of Istanbul city. The port feeds hinterland hosts a population of approximately 20 million. Turkey's biggest city and the industrial and commercial capital is Istanbul which is the pioneer of location and development of all types of investment.

Turkey has a population of 75 million world's 16th successful economy. Due to the fact that it locates in between Mediterranean, Aegean, Marmara Sea and Black Sea regions it has geopolitical position. So the crossroads of trade routes are available. The most important thing is that Turkey connects the Asian side of the world with European side. The only connectivity to the Black Sea (Bosphorus) crosses Istanbul.

Table 5. Top 10 World Container Ports

Rank	Port, Country	Volume 2013 (Million TEUs)	Volume 2012 (Million TEUs)	Volume 2011 (Million TEUS)	Website
1	Shanghai, China	33.62	32.53	31.74	www.portshanghai.com.cn
2	SIngapore,Singapore	32.6	31.65	29.94	www.singaporepsa.com
3	Shenzhen, China	23.28	22.94	22.57	www.szport.net
4	Hong Kong, China	22.35	23.12	24.38	www.mardep.gov.hk
5	Busan, South Korea	17.69	17.04	16.18	www.busanpa.com
6	Ningbo-Zhoushan, China	17.33	16.83	14.72	www.zhoushan.cn/english
7	Qingdao, China	15.52	14.50	13.02	www.qdport.com
8	Guangzhou Harbor, China	15.31	14.74	14.42	www.gzport.com
9	Jebel Ali, Dubai, United Arab Emirates	13.64	13.30	13.00	www.dpworld.ae
10	Tianjin, China	13.01	12.30	11.59	www.ptacn.com
39	Ambarli, Turkey	3.38	3.10	2.69	ww.altasliman.com/en

Source: The annual top 50 World Container Ports; 2014

INTERMODAL TERMINALS IN TURKEY

In recent years, Turkey's foreign trade is large increases. In 2004 foreign trade volume was while 161 billion dollars, in 2014 volume reach 330 billion dollars (http://www.tuik.gov.tr/PreTablo.do?alt_id=1046; 16.12.2014). One of the critical factors affecting as competitiveness of Turkish exports is efficient transport and logistics system. Insufficient and poor quality of transport infrastructure increases delivery time, therefore, the transport costs. This problem leads to a reduction of competitive advantage of Turkish products in international markets. Therefore, the transport infrastructure and improving the management will contribute significant reduction of costs in international trade.

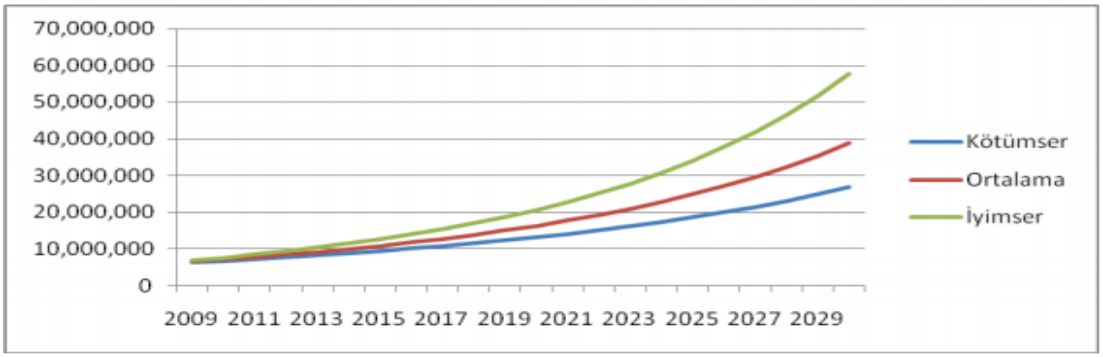
In our country, although there is a concept of intermodal terminals but practice is not yet widespread enough. In Integration process with European Union, even Turkey wants to be a regional power in global logistics, it is necessary to improve the intermodal transport system.

In our country, similar to distribution logistics centers in Europe and Asia is not yet established. Despite 87% of Turkey's foreign trade by the sea, there is no port creating high added value in the country.

Container Port in Turkey

Container handling port in the world in the second half of 1960 has begun to spread. However, container handling port in Turkey has begun to be seen in the second half of the 1980s. First private container terminal in 1987 (Gemport) opening into operation in Turkey, after the container is raised resulting in the share of private sector in port business every day. According to table 5 the world's first 10 container ports are very high comparing to the port capacity in Turkey. Lack of main ports which serves transferring goods through huge ships causes this case. The Figure 4 seen belongs to the container handling port of Turkey 2009-2030 Year Total Load Forecasting (TEU).

Figure 4. Turkey 2009-2030 Year Total Load Forecasting (TEU)



Source: Republic of Turkey ministry of transport railways, ports and Airports Construction General Directorate (2008)

Total demand for container handling the average of all ports in Turkey estimate to 10.7 million TEU in 2015, and in 2030 will be 39.9 million TEU. 9 million TEU capacities seem to be sufficient until 2014. Turkey needs to the new container handling capacity. This capacity is possible with new projects or expansions of existing port terminals.

Logistics Villages in Turkey

Logistics village is meant for national and international transportation, distribution, storage, handling, consolidation, separation, customs clearance, export, import and transit operations, infrastructure services, insurance and banking, containing many integrated logistics activities such as counseling and production. Logistic (Load) villages began to be created by TCDD in 2006, than establishment by the private sector. In this context, the establishment of some of the 19 villages targeted by TCDD largely completed, some of the construction process, some are still in the design or planning stage.

LOGISTICS SECTOR ANALYSIS AND RECOMMENDED STRATEGY ABOUT INTERMODAL TERMINALS (TURKEY IN GENERAL AND ISTANBUL IN PARTICULAR)

Comparing World's Logistics Information with Turkey's

General data about the logistics sector in the world economy are as follows;

- World economic market trade volume is 16 trillion dollars and logistics volume is average 6.4 trillion dollars. It means logistics trade volume is 40% part of world economic market trade volume.
- Our country today as 50-60 billion dollars (about one percent of the global logistics volume) has a logistics capacity. Used in this capacity is the average annual 6-8 billion dollars. In other words, the capacity is used of only 13%.
- Logistics capacity in developed countries, 10-12% of GDP per part. 2-5% in developing countries, and in Turkey this ratio of 2-3%.
- The developed countries spend 2% GNP for logistics activities. In developing countries is between 0.2% and 0.5%. This ratio is around 0.3% in Turkey.
- The developed countries logistics investment share is between 15-40% in total annual investment. This rate in developing countries remains between 2-5%. Turkey is the annual rate of 3%.
- The annual growth rate in the logistics industry, 5-12% in developed countries while in developing countries this percentage raises to respectively 15-25% levels. The average growth rate is 15-20% in Turkey.
- Two thirds of world logistics consists of transport and supply chain activities for the retail sector. In this context, the top 10 logistics companies in the global market situation with 27% of the total market. In our country, the share of the top 10 players received from all sectors ranged from 2% to 3%.
- Depending on the development level of the company about 25% to 80%, logistics activities are carried out using the rate of 65-85% by outsourcing Logistics Service Providers Companies. In Turkey, 6-8% of commercial companies fulfill their logistics outsourcing using 10-30%.
- In addition, enterprises have advantage from average 2.8 to 3.2 days using outsourcing in the supply chain.
- When the use of outsourcing logistics activities aside other will provide added value to businesses, providing profit between 60% and 45% in financial terms.

- When looking at the issue in terms of expenses, most important part of business in expenses constitute logistical costs. 15% 25 percent of the cost of logistics costs in the formation of the product is located. The product's selling price constitutes 4-20% of logistics costs. (MÜSİAD ;Logistics sectors report 2013, 2013;39)

Today, Turkey is 600 billion dollar worth of goods movement in the transition point between East and West; highways, railways, 3 sides of the surrounding seas, in the heart of the Eurasian trade with airports and distribution centers; Europe, the Balkans, the Black Sea, the Caucasus, Central Asia, goods between North Africa and the Middle East is a hub location of the stream. With this strategic position which has the potential to be the most important and valuable logistics base of this region. The volume of the logistics industry reached 8 trillion dollar in the world, the industry is estimated to reach to 10-12 trillion dollars in 2015. Turkey has to get a share from this industry using strategic position.

Competitive Power of Logistics Industry in Turkey

Despite of European crisis, Arab spring and political tensions in Syria, Turkey is capturing the growth figures in the logistics sector. Logistics sector is in the most important sector in turkey with 55 thousand truck fleet and 80 billion lira trade volume. Approximately 95 percent of passenger transport and about 90 percent of goods transport is done via the road in Turkey. Improvement of existing roads and newly constructed roads, gives impetus to the highway logistics.

In recent years, because of the fact that Turkey's airline companies grow in a global scale, very significant improvements happened that increase the power of cargo logistics. Moreover, until 2023 23.5 billion budget allocated to development of railways projects it will stop the deficiencies of Turkish railway sector. In 2023 the target of 500 billion dollar export, comes one of the most important logistic sectors in order to achieve this goal. To reach this target, transportation infrastructure and logistics services should be ready for quality and capacity. In addition to Turkey's logistic potential it has also the potential of Black Sea and Central Asia region because it is located in the center of it. But it is not enough to compete for supremacy of the location.

Suggestions to Improve Turkey’s Future Logistics Status

Logistics sector makes a significant breakthrough in Turkey's stable growth in 2013, a growth rate of 15-20%. The size of the logistics sector, which employed 500 thousand people with sub-sectors around 80 billion dollars. In 2015 is expected to increase to about three times that

volume. Turkey is located close to Europe, the Middle East and North Africa's market; it has the opportunity to access 1.5 billion consumers easily. Turkey is one of the most important member of Black Sea Economic Cooperation Organization and plays a key role in the Central Asia connected Pan-European transport corridors.

Turkey's ambitious vision for 2023 will celebrate 100 years establishment of the republic, just needs projected high goals for the transport and logistics sector. These targets are located in the following;

- 19 large-scale new logistics center
- 36,500 km of divided highway, 7,500 km of highways
- An undersea tube crossing the Bosphorus in 2019
- Finishing third bridge and integrated roads in Istanbul
- Çanakkale Strait bridge
- 10,000 km of high-speed train railway, 4,000 km of additional rail
- Making 8,000 km line electrical and signaling
- The renewal 500 km of railway in a year
- The opening of Railways for private sectors
- Renewal of the terminal and station for high-speed railways
- Supporting the rail project that will connect the Middle East, Caucasus and North Africa
- 400 million passenger capacity with new airports
- 3 new airport to Istanbul
- 750 aircraft fleet
- Connecting the railways of the main port
- Making transfer ports in Aegean, Mediterranean, Black Sea and Marmara.
- Having at least one of the world's top 10 ports In 2019
- Handling capacity of 32 million TEU container transport
- Handling 500 million tons of solid, 350 million tons of liquid cargo
- 10 million metric tons ship building capacity
- Making 100 marinas with the capacity of 50.000 yacht
- Making new modern customs
- Increasing the use of railways and maritime in local transport
- Intermodal transport should be encouraged
- Encouraging the value added project
- Developing and Supporting Combined Transportation
- Developing and Supporting Ro-La Lines

- Revitalization of the historic Silk Road
- Making new port-hub in Istanbul

A PROPOSAL FOR INTERMODAL TERMINAL IN ISTANBUL

Istanbul is the most important city for Turkish economy. Istanbul has a major industrial zone and production area. Moreover Istanbul's location is like a bridge connected with Asia and Europe. Two significant things for logistics are production and position. Istanbul has both of them. Istanbul has absolute advantage for the city to become an important international logistics hub. For this reason, promoting this city as a logistics center of international importance has been high on the agenda of the Turkish government.

90 percent of world trade is made by maritime and in our country it is 88 percent. There are 174 ports and piers in Turkey and the whole length is 8 thousand 333 kilometers. During the next 5 to 10 years, is expected to be the fastest growing segment of the cargo container in cargo traffic. So ports will continue to gain importance that is, we can say new intermodal terminal should be a harbor.

Istanbul is also a city of an industry. 42 of 100 biggest industrial establishments of Turkey are in Istanbul. And 250 of 500 biggest establishments are also in Istanbul. Istanbul Chamber of INDUSTRY (ISO) is Turkey's largest non-profit organizations. According to researcher the first five most developed provinces in Turkey are, in order Istanbul, Ankara, Izmir, Bursa and Kocaeli. Istanbul, Bursa and Kocaeli exist in Marmara region. The established terminal is required to carry this density region.

Another thing that made Istanbul the logistic center is that the third airport. Third airport is under construction. Third airport is being built in north of Istanbul Arnavutköy region. The third airport will be biggest in the world from the point of capacity view. This airport capacity will be 150 million annual. This airport will make Istanbul a hub of air cargo. The availability of this region would be possible by Yavuz Sultan Selim Bridge and highways. Also the railway which is going to built on this bridge will support the availability of the airport.

The terminal which is goes to make in this region will ease all the transportation activities. Even if the terminal establishes in the coastal region it will include 4 main transport activities inside. So the availability and infrastructure of the terminal would be very powerful.

Istanbul has benefited from its unique geographical location for millennia. The locational advantages of Turkey in general and Istanbul in particular have always been considered as an important strength by the Turkish central government. In this condition, in periodic program railways and maritime transportation have been promoted and capacities of ports will be

increased and adapted to become logistics centers which offer combined transportation opportunities.

According to the fact that Istanbul played critical role of being a hub for Turkey's international transportation corridors, The Organization for Economic Co-operation and Development (OECD) mentions this subjects. Also Istanbul supports air and overland routes to different countries. This is the significant role of industrial area that locates in between Black Sea and Mediterranean Sea.

From optimistic point of view, estimated local container handled in the Marmara region average is 15 million TEU in 2030. This number increases the average of 20 million TEU with transit goods. Today ports which locate in Marmara region can handle the capacity of average 7 million TEU. Moreover these forecasts are not based on added investment or value added. Even this case, Turkish port should increase capacity double. But it may not sound possible. Because for example Haydarpaşa port in Istanbul which run by TCDD can upgrade 600.000 TEU to 1.200.000 TEU. There is no expanded area for Haydarpaşa port. Even if the capacity reaches these numbers, the density will increase and the waiting period will extend. So it means that, there is a need for a huge port in this region. This port should be built in Istanbul and must include intermodal transportation options.

Location of Proposed Intermodal Terminal Establishment in Istanbul

The intermodal terminal should be established in the north of Istanbul, which the need for it was proved according to the above details. Because this region is newly improved and there is a wide space for constructions. The main factor of intermodal terminal is container that’s why the terminal should be built at the black sea coast and be in a port shape. Meanwhile it should be close and connected to new third airport. Third airport will be the most high capacity airport in Europe and Turkey will be a hub for air cargo. This terminal should also establish over the highway of Yavuz Sultan Selim Bridge. These highways would be Istanbul’s cargo transportation ways which all trucks pass. On the other hand the railway which passes Yavuz Sultan Selim Bridge and extends to Anatolia should reach this terminal. So the intermodal terminal would be connected to railway. Actually this railway will end in the third airport. The intermodal terminal should have large warehouses and storage. So the intermodal terminal would include the connection of seaway-airway, railway-seaway and railway-highway. At the first step it should support the cargo potential for the target of 2023 and then for 2050 and 2100. It should be neighbor of Canal Istanbul project.

Figure 5. A proposed map of intermodal terminal location

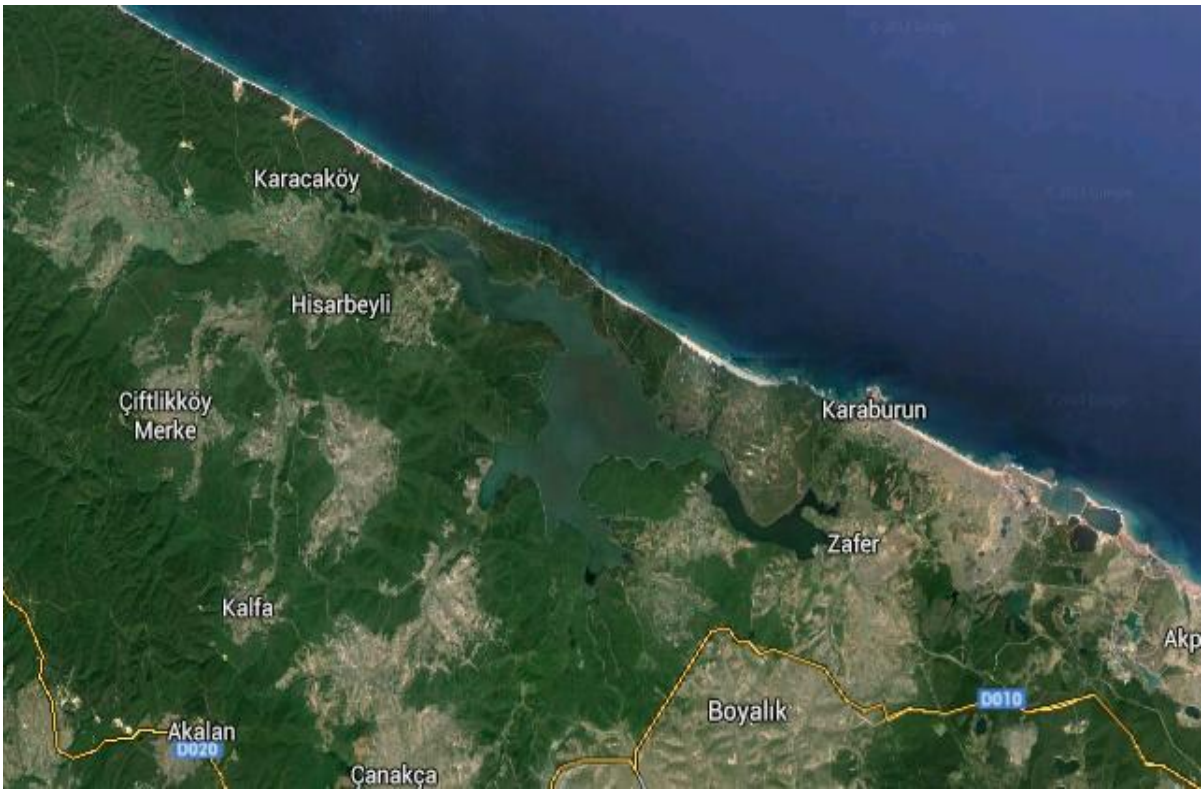


Figure 5. A proposed map of intermodal terminal location

This intermodal terminal would be built between Durugöl Lake and Black Sea coast. Whole location is going to be 20.000.000 square meters. This area starts from Karaburun and it will end Karacaköy. A terminal which has a huge port like this can support average 30 million TEU and 600 million cargos. This capacity is 5 times more than Istanbul ports capacity.

In this terminal there would be special areas for private companies. When this terminal establishes it would be a hub for all cargos which enter Istanbul. This terminal also play important role in distributing air cargo from third airport. It will distribute 30 million TEU cargos through connection of highways and railways. The terminal will play a strategic role by its strong infrastructure and high technology. Ship can easily pass Canal Istanbul and reach this terminal and at the same time the availability of Mediterranean Sea would be possible. This terminal would be a candidate for leadership in Black Sea, Europe and Middle East area. It will add more value to Istanbul's role in logistics center of world.

CONCLUSION

Turkey should improve logistics and physical infrastructure to provide a competitive advantage for intermodal transport corridors. Asian-European intermodal transport corridor is already the busiest economic activity corridor. Marmara region located in the middle of this corridor and also have a large exit point in foreign trade transport, because it is the most important industrial center. In addition, the Bosphorus Rail Tube Crossing project will accelerate the corridor.

Intermodal facility and investments are the medium and long term investments that require significant funding. Government must be organized and encouraged these investments. After privatization the important export port of Izmir Port will increase efficiency and the growth of economy of the region. Speed of Turkey's transport system needs to be improved in terms of cost and quality. Ro-Ro transportation should used in Mediterranean and Black Sea for domestic trade. In addition RO-RO corridor should be established for trucks without entering Istanbul traffic from east to Europe.

Factors which negatively affected the competitiveness of the company for the realization of Turkey's 2023 target should be avoided. During the transport of goods should be minimized delay and unnecessary costs in import and export operations. Under these conditions, the company also needs to develop new business strategies and processes. Logistics sector is also important to provide good quality services at an affordable price to the Turkish industrialists which have an international standard. In the recent 20 years logistics sector has reached to a great improvement in globalized world. Because of cheap labor and national resources the production centers moved to the other countries. The manufacturers aimed to reduce costs by

moving. This fact increased the demand for logistics. The most important factor in developing logistics is increasing the production.

Turkey is one of the most strategic important countries of the world. Turkey's land has been on the trade routes since many years ago. If Turkey improves logistics infrastructure regarding the developed economy and young population, it may play more active role in the world. The capital of Turkey's economy is Istanbul which increased its worldwide importance by government supports and interest of foreign capital.

Intermodal terminals effect on the economy directly. The TEU capacity of just one port in China is 5 times more than Turkey's. On the other hand Rotterdam has become famous just by its harbor. Also for example, in Louisiana ports there are 73.000 people working and the added value is 11 billion dollars. Because Istanbul is like a bridge between Asia and Europe the need for intermodal terminal is essential. The other factor that enhances Istanbul's value is government investments. One of them is third airport. Another one is Yavuz Sultan Selim Bridge. Istanbul Metropolitan Municipality (IMM) is looking for a way not to let trucks enter the traffic. The only solution is constructing new intermodal terminals.

This intermodal terminal will support Istanbul's required cargo for the next ten years. Together with these terminal Istanbul will continue to be a nominee of logistics center in the world. This is a survey on intermodal transportation improvement, factors and types. Also the network, corridors and routes which used in intermodal transportation are investigated. World intermodal terminals and Turkey's are researched in details. Lack of this subject in Turkey has been proved and an intermodal terminal establishment in Istanbul has been proposed.

The cost of this offered project is almost 10 billion dollar. Not only government but also private sector invest this amount of money for untried project in Turkey. Therefore the government financial power and private sector experience and administrative power should be unified. Besides government should consider this policy in order to supporting this project. Otherwise project infrastructure will catch new technology in order to compete with other intermodal terminals. If the system works properly we can offer good price for new customer, this situation would be possible with professional and technical staff. So for the first years we should transfer from biggest hub station. In addition we should consider about increasing the connection between this project and other hubs.

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