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Economic Analysis of Container Transhipment in the Eastern Mediterranean Region

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Abstract

With the increasing trade during the second half of the last century; container based transportation facilitated and enabled transhipment operations all over the world and as well as in the Mediterranean. In this context specifically, Suez Canal, which is located between the Eastern Mediterranean and Indian Ocean, offers significant opportunities in the container transpotation between Far East and European trade areas. And since the container ship sizes heading over the 20,000 TEU's is underway, Mediterranean transhipment operations are heading into a new era; feeder service distances will be more important than the main route deviation distances. The average transhipment ratio is 80% in the Eastern Mediterranean while for the whole Mediterranean is 43% and various markets of the Eastern Mediterranean, Black Sea, Adriatic Sea and Balkan countries can easily access from Cyprus. A container terminal at the Port of Gemikonağı (Karavostasi), North-eastern side of Cyprus is offering ideal conditions for grabbing a share from these activities. As motherland for Northern Cyprus community Turkey's hinterland, may count on behalf of the proposed Port of Gemikonağı which may become a container transhipment base for Turkey.

Keywords: Containerisation, Eastern Mediterranean, Transhipment Operations, Cyprus, Port of Gemikonağı.

Introduction

There is a mutual relationship between globalization and containerisation since containerisation is a system of intermodal freight transport using intermodal containers, and it reduced the heavy labouring and needs for warehousing, congestion in ports, significantly shortened shipping time and reduced losses from damage and theft. The impressive growth of Far East-Europe container trading, transiting through the Suez Canal has a substantial opportunity for the Eastern Mediterranean ports. The new Suez Canal Waterway will also have a positive effect on the container traffic in the Mediterranean; by permitting more traffic and bigger ships passing through.

Due to the continuing growth of container ship sizes in recent years, the transhipment operations in the Eastern Mediterranean, are proceeding into a new era. On top of all a recent stragetic development of the world's leading container liner shipping operators is in perspective; they believe that, the reduction of transporting cost per unit (TEU) lies in switching from port-to-port transportation into door-to-door transportation system.

The aim of this article is to analyse the transhipment advantages of containerisation at the Eastern Mediterranean and to study how to improve transhipment operations of containers in the Northern Cyprus ports by building and operating a "container hub port" at Gemikonağı. Being geographically located in a very convenient position in the centre of the

Eastern Mediterranean the Island of Cyprus has substantial opportunities for the container transhipment operations. Northern Cyprus ports by making the necessary investments in establishing a container terminal will join the race as a hub port.

Transhipment Property of the Container Transportation and Containerisation in the Eastern Mediterranean

Mediterranean container port traffic was realized as 55 million TEU's in the year 2014 and is expected to reach to 58.3 million TEU's in the year 2015 (MEDA 12th Ports Summit). The Eastern Mediterranean container port traffic is around 35 per cent of the total Mediterranean container port traffic. According to this percentage; Eastern Mediterranean container port traffic share will be around 19,250,000 TEU's in in the year 2014 and is expected to reach to 20,405,000TEU's in the year 2015. The Mediterranean regional shares, of container port traffic in the years (1980-2010) are given in figure 1.

It is strongly believed that; the container port traffic will increase more than this amount in coming years in the Eastern Mediterranean. This increase will be due to the widening of the Suez Canal and the expectations of the increases in container port traffic of the regions of the Black sea, the Adriatic and Balkan countries which are in the target of the Eastern Mediterranean hub ports.

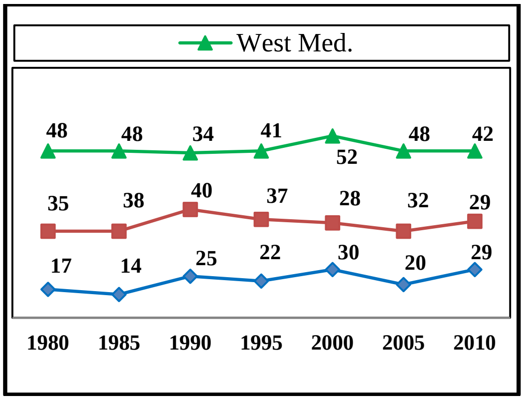

Fig 1. Container Port Traffic Percentages (%) by Port Range of Mediterranean, (1980-2010) Source: Authors' compilation based on DR, (2014, Fig. 2)

The Eastern Mediterranean, Adriatic and Balkan and Black Sea range cover more marginal, but rapidly growing economies of Eastern Europe, Russia and Turkey (Gouvernal, Rodrigue and Slack, 2012).

Mediterranean region, being on the main routes between Far East and Europe trade areas, became one of the most important competing regions of the world. Major hub ports in Eastern and Central Mediterranean are competing for more shares from the container distribution at the Eastern Mediterranean, Black Sea, Adriatic Sea and Balkan countries. Trade areas in the target of the Eastern Mediterranean Hub Ports and container distribution system are illustrated by the Author in the figure 2.

In recent years, the circulation of the industrial goods between economic regions has been enormously increased due to the container. "At container terminals, containers are transhipped from one mode of transportation to another. Within a terminal different types of material handling equipment are used to tranship containers from ships to feeder ships, barges, trucks and trains and vice versa. Over the past decades, ships have strongly increased in size, up to 18,000 TEU. In order to use these big ships efficiently, the docking time at the port must be as small as possible. This means that large amounts of containers have to be loaded, unloaded and transhipped in a short time span, with a minimum use of expensive equipment" (Iris and Koster, 2003).

Containers; easily can be transported among the ports in transit. This property of container transportation emerges ports, to invest and increase their capacity in an intensely competitive environment, to become a "regional relay port" or a "hub port" and grab a share of this action.

"An increase in Asian and Far Eastern trade and corresponding changes in the operational strategies of shipping lines is boosting transhipment and feeder demand in the Mediterranean region. Shipping lines are operating an increasing number of deep-sea relay services through the Mediterranean (calling at a few ports) to meet an increase in Far East trade" (EMTP, 2005).

"According to Drewry, the incidence of transhipment at container terminals worldwide (as a percentage of global throughputs) increased from 17.6% in 1990 to 28.5% in 2010 and did not experience any annual decline during that period" (GCMIO, 2015).

According to the MEDA's 12th Ports Summit; the Mediterranean container port traffic was around 52.1 million TEU's in the year 2013. The 43% of the Mediterranean container port traffic, which is around 22.4 million TEU's in the year 2013 were transhipment units in the hub and spoke system. The Mediterranean container transhipment activity forecast for the years (2014-2021) is given in figure 3 below (MEDA 12th Ports Summit).

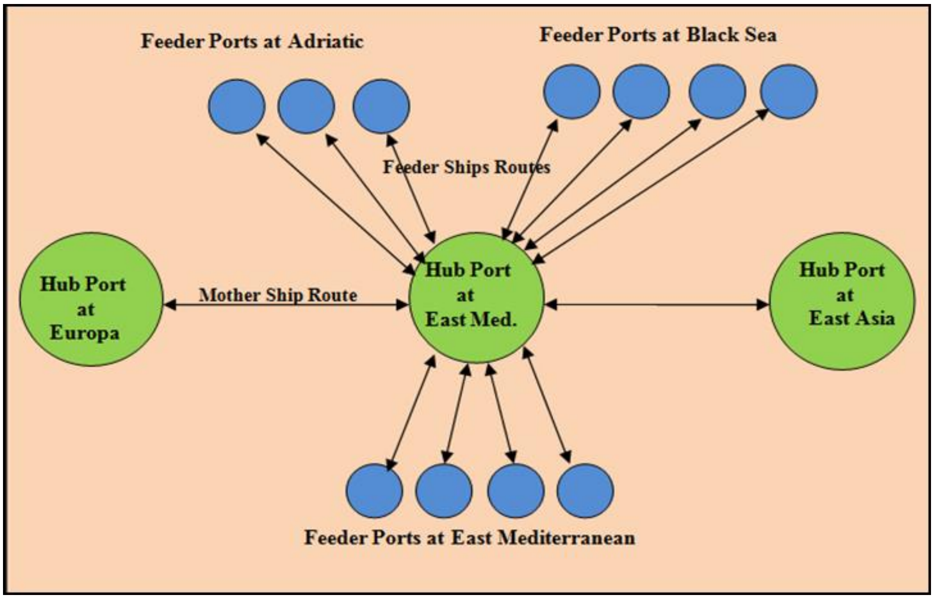

Fig 2. Container Distribution System in the Eastern Mediterranean Source: Author's own design.

The Eastern Mediterranean, Black Sea, Adriatic Sea and Balkan countries; are in the target of the hub ports of Central and Eastern Mediterranean. The total container traffic to the targeted areas for the year 2013; is 18-20 million TEU's. Hub ports of Central and Eastern Mediterranean serving in the targeted areas and their transhipment ratios are given in the table 1 below. As can be seen from the table, in the year 2013, the average transhipment ratio of the Eastern Mediterranean is 79.9%; while for the whole Mediterranean is 43%.

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The cause of the high transhipment capacity of the Eastern Mediterranean is that; the targeted markets, especially at the Black Sea and the Adriatic Sea, are too far from the mother ship's main route passing through the Suez Canal and Gibraltar.

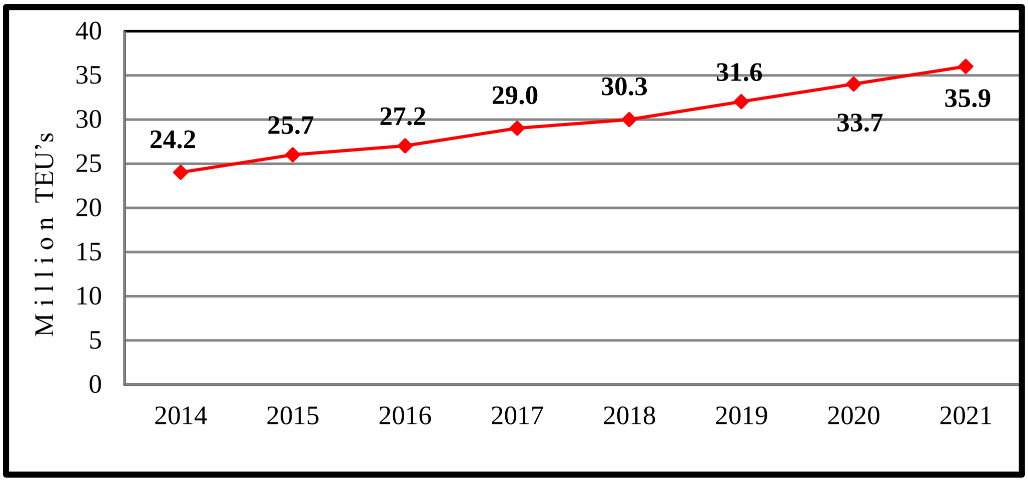

Fig 3. Mediterranean Container Transhipment Activity Forecast (2014-2021) Source: Authors' own compilation based on the '12th MEDA Ports Summit'.

Table 1. Central and Eastern Mediterranean hub ports and their transhipment ratios, Source: Various sources.

Port	Deviation Distance (NM)	Total Throughputs (TEU) 2013	Transhipment Ratio, %	Total Transhipment Throughputs (TEU) 2013
Gioia Tauro	66	3,087,000	93.6	2,889,432
Marsaxlokk	6	2,750,000	95.5	2,626,250
Piraeus	177	2,750,000	80.0	2,200,000
Port Said	0	4,100,000	95.0	3,895,000
Alexandria	40	1,508,000	70.0	1,055,600
Damietta	20	1,300,000	87.0	1,131,000
Mersin	339	1,378,000	25.0	344,500
Haifa	241	1,357,000	30.0	407,100
Limassol	254	307,060	65.0	199,589
Total		**18,459,060**	**79.9**	**14,748,471**

New Era for the Mediterranean Container Transhipment Operations

"With container ship sizes heading over the 20,000 TEU's is underway, Mediterranean transhipment operations are heading into a new era" (Rankin, 2015). Due to the changing conditions, facts at container shipping and transhipment operations are changing.

According to Rankin; with the transoceanic mother ships getting bigger in size, there will be new draft requirements up to 17 meters, of which the existing hub ports will not be able to meet. Due to this and some other facts; one or two major new hub ports in the Mediterranean region will become a serious need in the coming years.

Oceanic vessels passing through the Mediterranean are increasing in size and there is an increasing trend to use these ships to service the region through feeder systems" (EMTP, 2005).

Another fact for the new era of the Mediterranean transhipment operations is the new Suez Canal. The new Suez Canal will increase trade alongside the canal. The enlarged canal will allow ships to sail in both directions at the same time over much of the canal's length. The new Suez Canal is expected to double the capacity of the Suez Canal.

The new Suez Canal will accelerate container traffic in the Mediterranean in general. This will be reflected in transhipment traffic in the Mediterranean and transhipment traffic will increase accordingly.

On the other hand; container liner shipping operators are seeking solutions to increasingly competitive conditions in the Mediterranean. The best solution for this competition lies in the reduction of transporting cost per container unit (TEU).

The world's leading container liner shipping operators; believes that, the reduction of transporting cost per container unit (TEU), lies in changing the "port-to-port" transportation system to "door-to-door" transportation system. For the "door-to-door" transportation system; container liner shipping operators have to deal with the feeder service operations for the distribution of the containers. If the container liner shipping operators get involved with the feeder service operations, today's container transhipment factors and property will substantially change.

Another reality of the new era in the Eastern Mediterranean region for the transhipment process of containers, is the fact that; containers distributed to the Eastern Mediterranean, Black Sea, Adriatic and Balkan trade areas will be enormously icreased in the coming 10 years. Research made for the Gross Domestic Product-GDP and container port throughputs for the countries in the target of the Eastern Mediterranean hub ports, showed that; GDP will increas by 1,304.6 billion US Dollars and container port traffic will increas by 20,052,740 TEU's in the coming 10 years (See Annex 1).
Projection figures showed that the container port traffic in the Eastern Mediterranean hub ports will increase by around 20 million TEU's within ten years of time. This amount of increase in container port traffic shows the need of many new container terminals and a few numbers of container hub ports.

Due to the new facts given above and especially the draft requirements for the transoceanic mother ships getting bigger in size and the projection made for the trade areas in the target of the Eastern Mediterranean, which gave more 20 million TEU's in ten year's time, shows the need of new container transhipment hub ports in the Eastern Mediterranean.

According to the evaluations given above; the two islands, Crete and Cyprus in the middle of the Eastern Mediterranean, are in the best geographical position of becoming container transhipment hub ports in the Eastern Mediterranean.

With the increase of the container mother ship sizes transhipment operations will also be increased. Increases realized in the transhipment operations will bring the need of larger feeder ships operating in the Mediterranean region.

"Experts suggest that increased volumes in transhipment will bring about economies of scale in the regional feeder market, which larger shipping lines will take advantage of by establishing their own dedicated direct feeder networks" (EMTP, 2005).

Economic Analysis of the Main Route Deviation Distance and the Feeder Service Distances in the Eastern Mediterranean Region

At present; world's leading container liner shipping operators, are serving to container transportation through the "port-to-port" operation system. The "door-to-door" transportation system is carried out mostly by other feeder service operators.
At the "port-to-port" operation system; container hub ports in the Mediterranean region, have been chosen by the leading container liner shipping operator involved. With this system container liner shipping operator, always prefers hub ports with no deviation distance or with minimum deviation distances.

In the new era of container distribution system in the Mediterranean, where the "door-to-door" system will be applied; feeder service operations will be carried out by the world's leading container liner shipping operators.

In this concept; an analysis carried out, to compare the economic impact of the main route diversion distance and feeder service distances. In the analysis two ports have been chosen; one is Port Said of Egypt with no mother-ship deviation distance, and the other is Gemikonağı (See figure 4), a port in Cyprus which is in an ideal position in feeder service operations, for the trade areas in the target of the Eastern Mediterranean hub ports (See Annex 2).

The analysis showed that; world's leading container liner shipping operators, will benefit 5,001,592.38 US Dollars annually and gain 1,194.24 days annually, by choosing Gemikonağı as a hub port, instead of choosing Port Said. Taking into account that; giant container ships in 18,000 to 20,000 TEU's capacities will be in service; the world's leading container liner shipping operators will benefit more than the amounts given above provided by container mother ships of 6,000 TEU's in size.

1,194.24 days saved annually from the feeder service operations; means that containers in transhipment from the Port of Gemikonağı will reach the destination ports/markets earlier than being transhipped from Port Said.

Fig 4. Feeder Ships Routes from the Port of Gemikonağı and the Port of Port Said.

Furthermore; passing to "door-to-door" system container liner shipping operators by operating the mother ships and feeder ships will have the chance to cooperate better with the port authorities or even to operate the ports directly. Another fact to be mentioned here is that; it would not be reasonable and feasible for the container ships of 18,000 to 20,000 TEU's capacities, to go northbound as far as the Black Sea and/or Adriatic Sea, off their main route.

According to the evaluations given above; Crete and Cyprus are in the best geographical locations in the feeder service operations, which they are in the middle of the Eastern Mediterranean.

The Income of Container Transhipment Hub Ports

Container transhipment operations mean offloading containers from mother ships and stacking containers for a week's time, and then loading same containers onto a feeder ship for the final destination.

Container transhipment hub port revenues mainly consist of container mother ship's port dues, feeder ship's port dues, shifting of containers on board a container mother ship and transhipment handling operation charges. According to the international standards; for the transhipment operation of a 20ft container 60.00 US Dollars and for a 40ft container 80.00 US Dollars is charged. This amount is a net income for a hub port.

If the above given transhipment charges, applied to a hub port with a capacity of 3 million TEU's (1,800,000 units of 20ft (TEU) and 600,000 units of 40ft (FEU), totalling 3 million TEU's) 156,000,000.00 USD net income will be earned annually, as shown in the Table 3.

Table 3: Income of Container Hub Ports

	Container	**Units**	**Charge per Unit (USD)**	**Income (USD)**
1	20 feet (TEU)	1,800,000	60.00	108,000,000.00
2	40 feet (FEU)	600,000	80.00	48,000,000.00
Total				**156,000,000.00**

Containerisation in Turkey

Turkey has realized important increases during recent years, particularly after the economic growth of 2001. Turkey with 7,284,207 TEU's of container port traffic, was ranked 13th in the year 2013. Turkey is the fastest growing country in the Eastern Mediterranean and growth rate is likely to continue.

According the projection figures made for trade areas in the target of the Eastern Mediterranean hub ports, Turkey will reach to a capacity of 18,893,300 TEU's in the year 2023 (See Annex 1).

The Master Plan also expressed that, three container terminals each of them over a capacity of one million TEU's, in the Mediterranean, Aegean and Marmara coasts of Turkey will be necessary to be built. Turkey is well ahead of the container port throughput figures, however, is far behind of the container terminal capacities that was projected in the Master Plan mentioned above.

At present, Turkey is outsourcing its service needs through the hub ports of Gioia Tauro of Italy, Port Said and Damietta of Egypt, Marsaxlokk of Malta and some other hubs in the region.

Turkish ports (İstanbul, İzmir and Mersin) in terms of hinterland container port traffic are in the best position of the Eastern Mediterranean. But when mother ship's main route deviation distances and feeder service distances are in question, Turkish ports (İstanbul, İzmir and Mersin) are not in a good situation. This reality is highlighted at the report of "The Nationwide, Port Development Master Plan in the Republic of Turkey" prepared by Japanese experts in the year 2000.

Containerisation in Cyprus

Being in the middle of the Eastern Mediterranean; ports of Cyprus, had a great strategic importance through history. The economy of Cyprus has always enhanced by the opportunities that are derivative of its strategic function.

Cyprus is on the sea lane of the great maritime highway connecting the Mediterranean Sea to the oceans through two sea gates. Cyprus is a natural transhipment centre for Europe-Far East trade. The trade areas of the Eastern Mediterranean, Black sea, Adriatic Sea and Balkan countries can be easily accessed from Cyprus. Cyprus has a minimum diversion distance from the main routes between Far East and Europe. Cyprus is also giving opportunities for a hub port to the other deep-sea trades traversing the Mediterranean and as well as inter-regional seaborne traffic.

When deviation distance and feeder service distances are in question, Cyprus ports are in much better positions than Turkey. Especially at feeder service distances Cyprus ports are in the best location in the Eastern Mediterranean region. These facts are also highlighted at the report of "The Nationwide, Port Development Master Plan in the Republic of Turkey" prepared by Japanese experts in the year 2000.

Containerisation in Northern Cyprus

Turkey with Northern Cyprus should be evaluated in the same economic system. It should be borne in mind that the ports of Northern Cyprus will gain more importance, in the same logistics system with Turkey.
In this concept; as a motherland for Northern Cyprus community, Turkey can be accepted as the hinterland for Northern Cyprus ports. Due to close relations between Turkey and Northern Cyprus and being at a very close distance to the Turkish ports; the proposed container terminal in the Port of Gemikonağı is likely to have precedence among the other ports of the Eastern Mediterranean.

Container transhipment operations offer significant opportunities in Northern Cyprus. In this context; importance should be given to Northern Cyprus ports and strategies should be developed for boosting their capacities. Therefore macro level development planning of ports should be advanced.

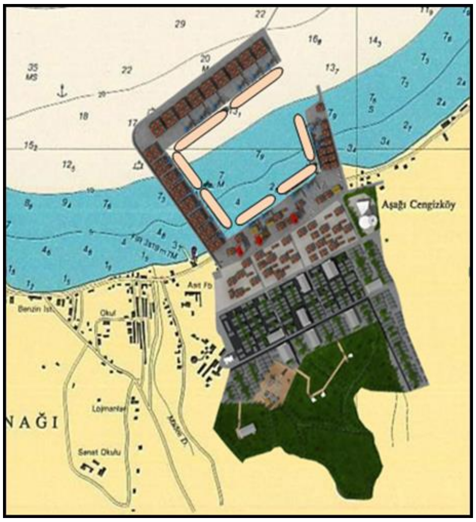

Fig 6. Proposed Port of Gemikonağı Source: Port İSBİ proposed Port of Gemikonağı.

One should note that there are factors over and above mother ship deviation distance and hinterland, responsible for the choice of a transhipment port, such as the port's inherent centrality and its operational efficiency, cost, conveniences, the availability of a shipping environment.

Being in a very good geographical position in the centre of the Eastern Mediterranean, the proposed container terminal in the Port of Gemikonağı will be one of the best candidates for container transhipment. Having enough depth, the proposed container terminal in the Port of Gemikonağı will also be able to serve ultra large container vessels as well. The proposed container terminal in the Port of Gemikonağı with a large land area of 200.00 hectares plus 50 hectares on the quays will have an enough stacking yard for large amount of containers. The proposed container terminal in the Port of Gemikonağı (Karavostasi) can be seen in figure 6.

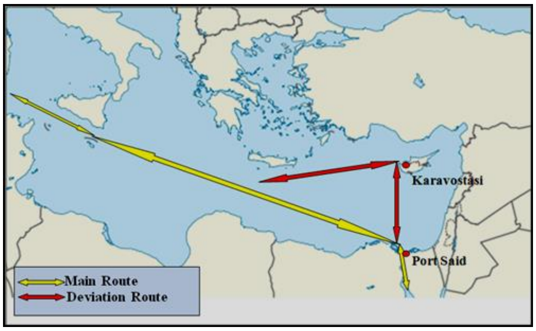

Fig 7. Mother Ships Main Route in the Mediterranean Source: Author's own design

Container mother ships crossing the Mediterranean are following the most suitable route between the Suez Canal and Gibraltar passages. The Port of Gemikonağı, with the 244 nautical miles of deviation distance is in a good position for becoming a transhipment hub port. Comparing hub port deviation distances of the Eastern Mediterranean; easily can be seen that the Port of Gemikonağı will have less mother ship's main route deviation distance, then most of the other hub ports. Figure 7 above, shows the main route for a mother ship in the Mediterranean passage and the deviation route of the Port of Gemikonağı.

Conclusion

The containers; easily can be transported among the ports as transhipment. This property of container transportation, emerge, ports to invest and increase their capacity in an intensive competitive environment, to become a "regional relay hub port" or a "hub port" and grab a share of this action.

The transhipment operations in the Mediterranean region were 43% in the year 2013, while in the whole worldwide was 28.5% in the year 2010. Hub ports of Central and Eastern Mediterranean container port traffic were 18,459,060 TEU's of which 79.9%, totalling 14,748,471 TEU's were in transhipment in 2013. With container ship sizes heading over the 20,000 TEU's is underway, the Mediterranean transhipment operations are heading into a new era in transhipment.

Container liner shipping operators are seeking solutions to increasingly competitive conditions. The best solution for this competition lies in the reduction of transporting cost per container unit (TEU). Container liner shipping operators believes that; the reduction of transporting cost per unit (TEU), lies in changing the port-to-port transportation to door-to-door transportation system. It is anticipated that the growth in the feeder market will be increasingly controlled by the largest shipping lines. If the Container liner shipping operators, get involved with the feeder service operations; today's container transhipment factors and property will change. Experts suggest that increased volumes in transhipment will bring about economies of scale in the regional feeder market, which larger shipping lines will take advantage by establishing their own dedicated direct feeder networks.

The economy of Turkey is the most powerful economy of the Middle East and Eastern Mediterranean and is a continuously developing and growing economy. If Turkey with Northern Cyprus is evaluated in the same economic system, the ports of Northern Cyprus will gain more importance, in the same logistics system with Turkey in the future. Turkey as a motherland for Northern Cyprus can be accepted as the hinterland for Northern Cyprus ports.

It is strongly believed that; in connection with the above evaluations, the proposed container terminal at the Port of Gemikonağı will be one of the well positioned container hub ports with 17 meters of draft, and with low deviation distance and best feeder service distances. The comparison made between the ports of Port Said and Gemikonağı on the feeder service costs showed that; Container Liner Shipping Operators will have significant earnings by choosing Gemikonağı as a hub port instead of choosing Port Said.

The Port of Gemikonağı container terminal will play the role of a container transhipment base for motherland Turkey.

References

DR, (2014), The Divergence of Regionalization: The Challenges of The Mediterranean Ports of Europe, http://people.hofstra.edu/jeanpaul_rodrigue/downloads/Divergence_Region alization-Final.pdf , (Acsessed date: 2014).

EMTP, (2005), Euro Mediterranean Transport Project, Mediterranean Transport Infrastructure Network, Technical Note 19 – Maritime Containerisation Trends, IP0335 – May 2005, http://www.euromedtransport.eu/Fr/image.php?id=2546, (Acsessed date: 2015).

Gkonis and Psaraftis, (2015), Konstantinos G. Gkonis and Harilaos N. Psaraftis, http://www.martrans.org/documents/2009/prt/TRB_paper%2010_3188_Gkonis_Psaraftis_revised.pdf, 2015, Some Key Variables Affecting Liner Shipping Costs, "Table 7: Estimations of container ships annual operating costs (Youroukos, 2007), (Acsessed date: 2015).

GCMIO, (2015), The Global Container Market, Industry Overview, http://www. Global ports.com/globalports/upload_docs/press/IndustryoverviewfromProspectusdated24June2011.pdf, (Acsessed Date: 2015).

Gouvernal, Rodrigue and Slack, (2012) Elisabeth Gouvernal, Jean-Paul Rodrigue and Brian Slack, The Divergence of Regionalization: The Challenges of the Mediterranean Ports of Europe, The Iame 2012 Conference, 6–8 September, 2012, Taipei, Taiwan, http://people.hofstra.edu/jean paul_rodrigue/downloads/Divergence_Regionalization-Final.pdf, (Acsessed date: 2014).

Iris and Koster, (2003), Iris F.A. Vis, Renée de Koster. 'Transshipment of containers at a container terminal: An overview', Rotterdam School of Management, 2003, http://web. itu.edu.tr/~keceli/container/genel.pdf, (Acsessed Date: 2014).

MEDA 12th Ports Summit, (2014), 12th MEDA, Logistics & Transport Forum 7th Meda Ports Summit, Barcelona, 3rd June 2014,http://www.silbcn.com/ponencias2014 / forum/Gerar do_Landaluce.pdf,(Acsessed date: 2014)

Rankin, (2015), Stuart Rankin, Mediterranean Battleground, Port strategy, 10 Feb 2015, http://www.portstrategy.com/news101/insight-and-opinion/postscript/Mediterranean-battleground (Acsessed Date: 2015)