AN ANALYSIS OF SEABORNE TRADE THROUGH ISKENDERUN BAY

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ABSTRACT

Increasing trade volume and globalisation of supply chains have increased the importance of ports in international trade. Due to these developments, ports need to analyse the commodities in their hinterland to be able to meet their customer requirements. Iskenderun Bay, which is considered as a gateway to the Mediterranean Sea, has sufficient infrastructure to serve several commodity groups. The share of the total cargo handling of Iskenderun Bay is 9.34 % in Turkey. This study aims to analyze the frequency distributions of shipments, to determine the prominent cargo groups as well as exporting/importing regions of the ports located in Iskenderun Bay. The total amount of import-export cargoes and cargo groups have been analysed by the loading/discharging tonnages of the vessels, exporting/importing regions and the handling ports in Iskenderun. Calculation of the total amount of cargo on ton basis and shipment frequency has been found by using RStudio software to determine prominent cargo groups and main export/import regions. Assan Port, Yazıcı Port, Isdemir Port, MMK Metalurji Port, Orhan Ekinci Pier, Limak Port, Gübretaş Port, Sasa Terminal, and Petrol Ofisi Pier Port have been selected for the analysis.

Keywords: Seaborne Trade, Cargo Analysis, Iskenderun Bay, Data Analysis, Frequency Distribution

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İSKENDERUN KÖRFEZİ DENİZYOLU TİCARETİ ANALİZİ

ÖZET

Ticaret hacminin artması ve tedarik zincirinin küreselleşmesi limanların uluslararası ticaretteki önemini artırmıştır. Bu gelişmeler sebebiyle limanlar, müşterilerinin ihtiyaçlarını karşılayabilmek için hinterlandlarında bulunan ürünlerin analizini yapmaya ihtiyaç duymaktadırlar. Akdeniz'e açılan kapılar olarak nitelendirilen İskenderun Körfezi, birçok ürün grubuna hizmet verebilecek yeterli altyapıya sahiptir. Türkiye'de toplam yük elleçlemede İskenderun Körfezi'nin payı %9,34'tür. Bu çalışmanın amacı, İskenderun Körfezi'nde bulunan limanlara ait yükleme sıklıklarını analiz etmek ve öne çıkan yük gruplarını ve ihracat/ithalat bölgelerini belirlemektir. İthalat ve ihracat yüklerinin toplam miktarları ve yük grupları; gemilerin yükleme ve boşaltma tonajları, ithalat ve ihracat yapılan bölgeler ve İskenderun'daki elleçleme limanları bazında analiz edilmiştir. Ön plana çıkan yük gruplarının ve başlıca ithalat/ihracat bölgelerinin belirlenmesi için Rstudio yazılımı kullanılmış, toplam yük miktarları ton bazında hesaplanmış ve yükleme sıklıkları bulunmuştur. Analiz için Assan Limanı, Yazıcı Limanı, Isdemir Limanı, MMK Metalurji Limanı, Orhan Ekinci İskelesi, Limak, Gübretaş Limanı, Sasa Terminali ve Petrol Ofisi İskelesi belirlenmiştir.

Anahtar Kelimeler: *Denizyolu Ticareti, Yük Analizi, İskenderun Körfezi, Veri Analizi, Frekans Dağılımı.*

1. INTRODUCTION

On a global scale, businesses need to perform their transportation activities on a competitive basis. In line with the requirements, logistics, and logistics nodal points have become increasingly important, and competition in the international area has become more intense (Song and Jung, 2009:117). Becoming a global dimension beyond the nation's borders of supply chains has transformed the ports into maritime logistics hubs. Increasing in maritime transport volume has been increased the importance of ports in the competitive environment (Esmer, 2008:114; Ateş et al. 2013; 2-3; Monie, 1987: 1).

Nowadays, maritime transportation shows a significant increase compared to previous years In Turkey. Foreign trade volume of Turkey reached from 82.2 billion dollars (2000) to 341.1 billion dollars (2016) (TSI, 2018). According to Republic of Turkey Ministry of Transport, Maritime Affairs, and Communication, total handling volume at Turkish ports had been reached from 178,061,018 tons in 2014 to 376,900,946

tons at the end of the year 2016 (TR Ministry of Transport, Maritime Affairs, and Communication, 2017). The increase in trade and cargo volume makes it necessary for ports to analyse the commodities in its hinterland.

There are five main port regions in Turkey as Iskenderun Bay, Nemrut-Aliağa Bay, Gemlik Bay, Ambarlı Port Region and İzmit Bay. More than half of the ports located in these regions in Turkey (Esmer and Duru, 2017:216). Iskenderun Bay, located in Eastern Mediterranean region, has public and private ports and terminals (IMEAK DTO, 2015:115). Iskenderun Bay, considered as a gateway to Middle East countries due to its geographical proximity, has dry bulk cargo, container, LPG, LNG and crude oil terminals. Port activities in Iskenderun Bay are mainly based on iron-steel and its supporting industries. Because some iron steel companies - Tosyalı Iron and Steel Ind. Co., Ekinciler Iron and Steel Industries Inc., Yazıcı Iron & Steel Industry Inc., Iskenderun Iron and Steel Works Co.- which are ranked among the Top 500 companies according to ISO Top 500 Companies in Turkey, located in Iskenderun region and uses Iskenderun Ports (ISO, 2016; TR Ministry of Public Works and Settlement, 2007:37).

Iskenderun is the district of Hatay Province. When examining the industrial profile of the Iskenderun region in more detail, there are seven Organised Industrial Zones (OIZ) entirely within the boundaries of Hatay Province. These industrial zones are Iskenderun OIZ, Iskenderun OIZ (II.) Antakya OIZ, Payas OIZ, Erzin OIZ, Hassa OIZ, Kırıkhan OIZ (TR Ministry of Science, Industry and Technology, 2017). According to TR Eastern Mediterranean Development Agency (2013), there are 807 companies in the food, metal commodity, petrochemical, coal, rubber and plastic, textile and leather, forest product and furniture, ore, stone and soil-based industry, metal industry, paper products and printing industry (Doğaka, 2013). In addition to the trade characteristics of the region, attracting the investments to the region will increase the potential of the Iskenderun in terms of becoming a substantial industrial base TR Ministry of Public Works and Settlement, 2007:28). Accordingly, the total amount of cargo handling in the area where is under the responsibility of Harbour Master of Iskenderun basis reached from 13,089,929 tons in 2014 to 40,188,126 tons at the end of 2016 TR Ministry of Transport, Maritime Affairs, and Communication, 2017).

Many writers conducted systematics research into analysing the cargoes regarding ports and hinterlands. Generally, these studies performed regional basis. Idrus et al. (2015) analyzed connectivity level

of the maritime transport system in Sulawesi corridor by hinterland analysis, Klassen Typology analysis and connectivity analysis to find the potential of the region. Itoh (2013) examined the market area of Japanese ports by clustering analysis. Authors determined that there was a significant structural change in market areas of ports in export and import cargoes between the period of 1988 and 2008. Pardali and Stathopoulou (2005) port competition based on the dry bulk, container, liquid bulk and Ro-Ro cargoes by traffic volume and market shares of 12 Port Authority S.A. between the period of 1990 and 2003. Seoane et al. (2013) examined the maritime cargo routes and its changing trends between 2007 and 2011 years. The study implied the correlation between the cargo types and dynamics of transport flows. Notteboom (2008) studied relationships between the seaports and hinterland from the viewpoint of global supply chains. The study pointed out that choice of the distribution network is based on the commodity types and delivery frequencies. Esmer (2008:113-125) analysed the cargoes and hinterland of Port of İzmir. In the study, the author examined cargo and the vessel statistics in detail, and import and export cargoes were classified according to origin and destination regions and specific cargo groups. Results of that study showed that North Europe was the most preferred region regarding import shipments to Port of İzmir and American Continent was the top importing region. Bayraktutan and Özbilgin, (2013:81-92) analysed the distribution of road freight transport by the city in Turkey. The study pointed that cargo volume was higher in developed regions, while the cargo volume was lower in less developed regions. Elliott (1968:153-170) examined the range of commodity in the hinterland of Port of Tyne and trading areas. Apart from the academic studies, sectoral reports analysed the cargoes, ports and the cities by and the total quantity of handling. TR Ministry of Transport, Maritime Affairs, and Communication (2014; 2015a) reported the current situation of Turkish merchant marine fleet and seaborne trade in the world rankings. The reports placed the vessels, maritime transport, incentives to industry and ship industry statistics. Another report of TR Ministry of Transport, Maritime Affairs, and Communication examined the commodity flows in hinterlands and the factors to affect the development of the port hinterlands which have up to 1,000,000 tons or 100,000 TEU handling capacity. The report also found that freight corridors, the commodity dispersion matrix and distribution of the modes of transport in specified hinterlands (TR Ministry of Transport, Maritime Affairs, and Communication, 2015b:1-251). 2. Interim Report of Transportation Coastal Structure Master Plan Study stated the export and import volume of the ports and current situation and developments of seaborne trade (General Directorate of Railways Harbours and Port Construction, 2017).

Most reports in the field of commodity and cargo analysis of the port hinterland have focused on statistics of the current situation of the ports, vessels fleet, seaborne trade, cargo volume and handling capacities of the ports. Also, the previous academic studies have dealt with the specific port hinterland. These studies provide useful information to understand commercial trends of the ports in the region and well-coordinated statistical data of the ports.

The study aims to analyse the frequency distributions of shipments and amount of cargo groups which were mostly imported-exported in Iskenderun Bay. Furthermore mostly exported or imported regions were determined within the study. It is also aimed to take advantage of transforming the mass export and import data into meaningful indicators to understand the export and import tendencies and profiles of the ports located in Iskenderun Bay. Assan Port, Yazıcı Port, Isdemir Port, MMK Metalurji Port, Orhan Ekinci Pier, Limak Port, Gübretaş Port, Sasa Terminal, and Petrol Ofisi Pier Port were selected for the analysis. Prominent cargo groups and export/import countries were analysed based on the 2016 and 2017 statistics.

2. STRUCTURE OF THE PORTS AND HINTERLAND OF THE ISKENDERUN BAY

Iskenderun region has an extensive hinterland covering many countries such as Syria, Iraq, Iran, and cities such as Gaziantep, Southeastern Anatolia Region (GAP Region), Osmaniye, Ankara, Niğde, Adana, Adıyaman, Kilis, Kayseri, Malatya, Elazığ, and Hatay (Ateş, 2014:448, Isdemir, 2017). Also, Yozgat, Kayseri, Sivas, cities of Southeastern Anatolia Region, and Eastern Anatolia Region are located in the common hinterland of the ports in Mersin and Iskenderun (TR Ministry of Transport, Maritime Affairs, and Communication, 2015b). The total amount of cargo handling in Turkish ports including transit and cabotage shipments was 430,201,162 tons. The total amount of cargo handling was 40,188,126 tons including transit and cabotage shipments in Iskenderun region. The share of total cargo handling of Iskenderun region was 9.34% across the country (TR Ministry of Transport, Maritime Affairs, and Communication, 2017).

The ports located in Iskenderun Bay are Limak Port, Milangaz LPG Terminal, Sasa Terminal, Petrol Ofisi Pier Port, Yazıcı Port, Orhan Ekinci Port, Assan Port, Isdemir Port, MMK Metalurji Port, Delta Terminal, Aygaz Terminal, Port of Toros, Ceyhan Marine Export

Terminal, Botaş Terminal, İsken Port, and Denbirport Terminal. While the ports in the north of the region perform mostly in liquid cargo handling activities, the ports mostly in bulk, general cargo and container are located in the south of the region (TR Ministry of Transport, Maritime Affairs, and Communication, 2015a).

The geographical position of the ports determined within the scope of the study is shown in Figure 1.

Figure 1: Location of the Specified Ports in Iskenderun Bay
Source: Created by Authors

Limak Port: The port which previously operated as a subsidiary of TCDD (Turkish State Railway) was transferred to Limak Group for 36 years in 2011 with concession agreement (IMEAK DTO, 2015:170). After the transfer, piers, warehouses, buildings, port gates were reconstructed, and new equipment was bought. Additionally, the seabed was dredged, and the draft was deepened to 14.5-15 meters (Limakport, 2017).

Assan Port: Assan Port Operator Inc. was established by Kibar Holding in 2010 to serve Panamax, Super Post-Panamax and Post-Panamax container ships. The port has 16-19 meters draft and 250,000 TEU container per year and 1,700,000 tons per year general cargo capacity. It is expected that the capacity will reach to 400,000 TEU per year with the new investments (Assan Port, 2017a; Assan Port, 2017b).

Yazıcı Port: Yazıcı Port established by Diler Holding has 7,500,000 tons capacity and 6.5-19.5 draft level. Yazıcı 1 and Yazıcı 2 ports have ten

piers, customs warehouses, customs area and equipment (Diler Holding, 2017).

Isdemir Port: The port which is referred to the most prominent bulk and general cargo port in Mediterranean region meets not only its own plant's requirements but also services to its customers. Isdemir Port has five piers and 13.5-19 meters draft level which can serve the ships which are between the 60,000 to180,000 DWT (Isdemir, 2017).

MMK Metalurji Port: General cargo commodities, scrap, iron-steel intermediate goods, container, bulk commodities, cargoes of Ro-Ro ships, fresh produce commodities are being handled in the ports. The port has 14 meters draft level and 400,000 m^2 area (Port Operators Association of Turkey, 2017).

Orhan Ekinci Pier: The port has 13-19 meters draft level and proper infrastructure to berthing vessels up to 70,000 DWT. Nonbonded warehouse, outdoor storage and warehouse services are being given in the ports (Ekinciler, 2017).

Gübretaş Port: the port has the 0-20 meters draft level, and services to vessels up to 60,000 DWT pier length of the port is 812,68 meters and services are being provided to general cargo and bulk cargoes except for scrap commodities (Gübretaş, 2017).

Petrol Ofisi Terminal: Annual handling capacity of the port is 650,000 tons, and liquid petroleum products are being handled in the terminal.

Sasa Terminal: The terminal provides services to chemical tankers and liquid petroleum products. The draft level is up to 35,000 DWT. The terminal is owned and operated by Sasa Polyester Industry Inc. Sasa has 380 m^3 storage tank capacity and 300,000 ton handling capacity per year. Five buoys are ranging between 9 meters and 12.5 meters. The total length of the pipeline is 460 meters approximately.

3. METHODOLOGY

Statistics are evaluated under the descriptive and inferential statistics. Descriptive statistics involves a series of numbers that summarise the facts occurrences within the sample. Conversely, the scope of the inferential statistics enables researchers to determine whether there are differences between two or more samples (Thompson, 1998: 57). Descriptive analysis enables utilising the historical data to analyse and

interpret the past (Jatain and Ranjan, 2017: 10). In addition to being an easy method for statistical analysis, it allows the interpretation of large numbers of data in a controllable and organised manner. With the analysis, percentages and frequencies can be turned into an outcome of the decision making and gaining insight into the situation (Kaushik et al. 2014: 1189). The method necessitates frequency analysis of the data (King and He, 2005:667). Frequency analysis is commonly used to describe data which are collected by experimental and survey researchers (Büyüköztürk, 2012: 21). Distribution of frequency illustrates values or distribution of variables falling into the categories (Lewis-Beck et al. 2004:405). By the aim of the study, the data of 2016-2017 export-import data were analysed to summarise and to describe the condition of the export and import tendencies of the specified ports. Frequency analysis was used to examine the frequency distribution of the 2016-2017 export and import shipments to make a large amount of the data into meaningful for the analysis. Shipments frequencies were cross-tabulated to see an overall view of the shipments performed at the specified ports. Additionally, total cargo amounts were calculated, and shipment frequencies were found out according to cargo groups, regions, and ports to determine the prominent cargo groups and export/import regions for Iskenderun Bay.

The data were received from IMEAK Chamber of Shipping Iskenderun Branch as raw data in MS Excel format. The period covers the shipments between 2016 and 2017. The data were analysed by tons without regard to any distinction between the container, dry bulk and general cargo. The data of all ports located in Iskenderun Bay have not been reached. For this reason, the data of 9 ports in Iskenderun Bay were included in the study.

IMEAK Chamber of Shipping Iskenderun Branch classified the raw data based on transit shipments, country of loading, year of arrival and departure, loading tonnage, discharging tonnage, port of loading and port of discharge. Four data files involved 4,418 rows in total. The files covered not only export and import data but also cabotage and transit shipments. Besides, there were missing values in the port of loading/discharging, shipments tonnages and cargo types columns. Due to the existence of a large amount of data, and difficulties in eliminating of missing values, "Rstudio" software tool was used to analyse and categorise the data. "R" is a kind of software language that commonly used for data analysis, statistical calculation, data manipulation and graphical view (R Project, 2018; Özkan and Özkan, 2017: 16). It can be added many features to the tool for enhancing productivity in statistical

data interpretation (Horton and Kleinman, 2015:211). R tools present a vast variability of new statistical developments instantly comparing to the other statistical tools (Kolaczyk and Csardi, 2014: 8). With the tool, the user can develop new programming languages to gain more flexibility in analysing big data (Özkan and Özkan, 2017: 16). One of the advantages of R tools is that all data files can be seen simultaneously. In comparison, the other statistics tools, "R" console provides to coder eliminating missing values and manipulating the data in line with the individual needs (Hillebrand and Nierhoff, 2015: 14-102). This tool is widely used in transport studies. Çavdar and Ferhatosmanoğlu (2018: 19-33) estimated the airline customer lifetime value by using R tool. de Lima et al. (2016) found out the dynamics of fertiliser transport in Brazil which cause the different freight rates, and RStudio were used to forecast regression parameters. Gokasar et al. (2015) used RStudio to analyse the data of automated fare collection system obtained from BRT-Bus Rapid Transit line. Maksood and Achuthan (2017) estimated the energy consumption of Oman by using R. Moncayo-Martinez, and Ramirez-Nafarrate (2016) visualised the mobility modelling in the bike-sharing in Mexico City to foresee the reactions of the stations based on the data analysed by using RStudio.

The data in MS Excel format imported to RStudio tool, then the data transformed into the data frame. Name of commodities and countries were changed and reclassified under the specified categories. Hence, calculations and frequency distributions were displayed. In line with the first classification by the chamber, the data were inductively reclassified by region (Asia, Europe, Africa, American Continent, the Middle East, and the Black Sea), cargo groups (iron, mineral, coal, fertilizer, cement, petroleum product, chemical product and "other") and the ports (Assan Port, Yazıcı Port, Isdemir Port, MMK Metalurji Port, Orhan Ekinci Pier, Limak Port, Gübretaş Port, Sasa Terminal, and Petrol Ofisi Pier Port).

4. ANALYSIS OF THE DATA

4.1. The Analysis of 2016-2017 Export-Import Cargo Groups Handled at Ports

Table 1 shows the classified commodities included in the analysis. This classification shows the difference in export and import shipments. Import cargo analysis involves the chemical products; export cargo analysis includes the cement products. There are no data on cement

products in import shipments and no data on chemical products in export shipments.

Table 1: Classification of the Commodities by Cargo Groups

Cargo Groups	Commodities
Iron Products	iron and steel products, pig iron, slab, processed iron, steel roll, iron pipes, iron wire rod, sheet metal, slag, iron wire rod, iron ore, iron ore concentrate
Mineral Product	aluminum, florspat, barium, calcite, aluminum ore, bauxite, manganese ore, calcite, chromium, chromium ore
Coal Product	coking coal, pit coal, goudron
Fertilizer Product	urea fertilizer, phosphatic fertilizer, compound fertilizer, compost fertilizer
Cement Product	white cement, cement
Petroleum Product	benzole, natural bitumen, gas oil, diesel oil, petroleum coke
Chemical Product	coustic soda, paraxylene
Other Products	pumice stone, tufa, gypsum, ingot, gypsoplast, wheat, plant equipment, wind turbine tower, tank truck, tanker truck bed, miscellaneous materials, cossette, corn, pallet, plastic tank, prefabricated materials, trailer, fodder and pasture, soy-beans, flour, floating platform

In the light of the classifications mentioned above, Figure 2 shows the 2016-2017 export data analysis in iron, mineral, coal, fertilizer, petroleum, cement, and other product groups.
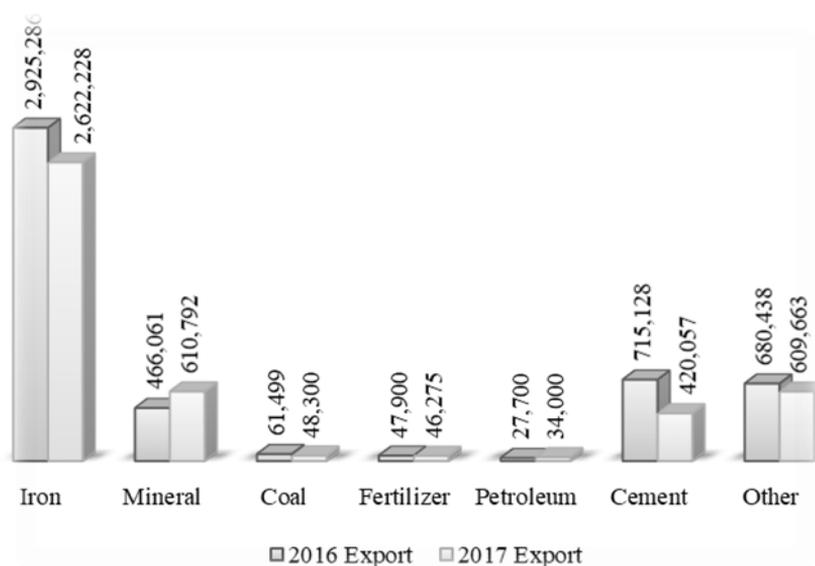
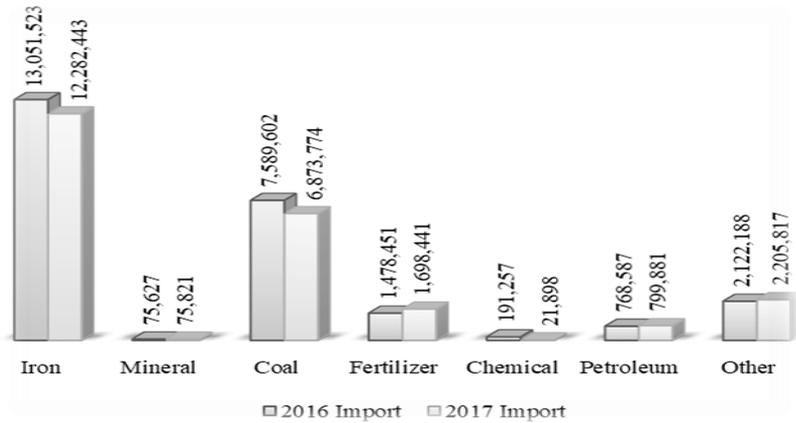**Figure 2:** The Analysis of the 2016-2017 Export Cargo Groups Handled at Specified Ports Groups (Ton Basis)

As it is shown in the Figure 2, total export volume was 4,924,012 tons in 2016 whereas this volume reached to 4,391,315 tons in 2017. It is seen that there is a decrease in the export volume of all cargo groups except mineral and petroleum products cargo groups. The export volume of the iron products group had the largest share among the other groups in both 2016 and 2017. The total volume of the iron products group decreased to 2,622,228 tons in 2017 tons from 2,925,286 tons in 2016. The total volume of the mineral group increased 144,731 tons; petroleum product increased to 34,000 tons and. Table 2 indicates the frequencies of the export shipments in 2016-2017.

Table 2: Frequencies of 2016-2017 Export Shipments

Cargo Groups	Iron	Mineral	Coal	Fertilizer	Cement	Petroleum	Other	Total
Frequencies of the export shipments (2016)	420	83	8	6	69	5	124	715
Frequencies of the export shipments (2017)	403	96	6	10	62	5	119	701
Total	823	179	14	16	131	10	243	1,416

The downtrend in export cargo volume can be deduced from Table 2. However, shipment frequencies of coal and fertiliser cargoes increased. It stemmed from small quantity shipments at one time as such in petroleum cargo group.

In addition to import cargo volumes, the import volumes of 2016-2017 are shown in Figure 3.

Figure 3: The Analysis of the 2016-2017 Import Cargo Groups Handled at Specified Ports

In the Figure 3, iron had the highest share among the cargo groups in 2016 and 2017 as well export. However, it can be seen that there was a significant decrease in iron cargo volume in 2017. The cargo groups that showed a decrease in import cargo groups are coal and chemical product (Coal dropped 715,828 tons, and chemical dropped 169,359 tons). Whereas, mineral, fertiliser, petroleum product and other group increased in 2017. The highest increase was recorded in fertiliser with a rise of 219,990 tons among the four cargo groups.

Table 3: Frequencies of 2016-2017 Import Shipments

	Iron	Mineral	Coal	Fertilizer	Chemical	Petroleum	Other	Total
Import (2016)	562	35	108	132	46	35	184	1102
Import (2017)	479	28	114	110	4	35	208	979
Total	1,041	63	222	242	50	70	392	2,081

According to Table 3, some shipment frequencies do not show similarity according to their increase. For instance, fertiliser cargo group showed an increase 219,990 tons in 2017, yet the frequency of fertiliser shipments decreased due to increase in the amount of cargo carried in a single voyage as such in petroleum product carriage.

4.2. Analysis of 2016 and 2017 Export Shipments of the Specified Ports by Region and Cargo Groups

Regarding 2016-2017 export/import data of Iskenderun Bay, all cargo groups were categorised under the six regions. Regional analysis of the cargo groups is shown in Table 4 and Table 6. Table 5 and Table 7 indicate frequencies of the export shipments (2016-2017).

Table 4: Cargo Groups and Region-Based Analysis of the Export Shipments in 2016 (Ton Basis)

Export (2016)	Asia	Africa	Europe	American Continent	Black Sea	Middle East	Total
Iron	192,653	781,568	459,575	16,050	757,663	717,777	2,925,286
Mineral	1,036	51,101	106,600	68,500	159,234	79,590	466,061
Coal	17,500	-	43,999	-	-	-	61,499
Fertilizer	3,150	27,750	-	-	-	17,000	47,900
Petroleum	7,600	-	11,200	-		8,900	27,700
Cement	25,800	416,469	5,352	112,499	35,110	119,898	715,128
Others	89,380	366,894	13,326	7,066	46,234	157,538	680,438
Total	337,119	1,643,782	640,052	204,115	998,241	1,100,703	4,924,012

It is clear that the top seaborne trade partner was Africa with the 1,643,782 tons whereas the least exported region was American Continent in 2016. Africa was the mostly imported iron products, mineral, fertiliser, cement and the "other" group shipments. Black Sea region was placed on the top of the mineral group exports.

Table 5: Frequencies of the 2016 Export Shipments by Region and Cargo Groups

Export 2016	Asia	Africa	Europe	American Continent	Black Sea	Middle East	Total
Iron	55	135	81	1	35	113	420
Mineral	1	11	13	3	45	10	83
Coal	2	-	6	-	-	-	8
Fertilizer	2	2	-	-	-	2	6
Petroleum	1	-	2	-	-	2	5
Cement	12	26	2	6	11	12	69
Other	49	25	7	2	8	33	124
Total	122	199	111	12	99	172	1,416

According to the Table 5, the highest number of shipments were performed in Africa in parallel with the total tonnage. The second highest shipment belonged to the Middle East.

Table 6: Cargo Groups and Region-Based Analysis of the Export Shipments in 2017 (Ton Basis)

Export (2017)	Asia	Africa	Europe	American Continent	Black Sea	Middle East	Total
Iron	355,832	388,880	785,918	72,360	178,527	840,711	2,622,228
Mineral	5,700	28,492	204,050	91,900	174,850	105,800	610,792
Coal	31,900	-	16,400	-	-	-	48,300
Fertilizer	8,550	34,800	-	-	-	2,925	46,275
Petroleum	-	-	34,000	-	-	-	34,000
Cement	45,340	100,737	-	225,780	-	48,200	420,057
Other	84,119	25,549	97,424	88,651	28,905	285,015	609,663
Total	531,441	578,458	1,137,792	478,691	382,282	1,282,651	4,391,315

According to the Table 6, the most significant amount of the exports were bought by the Middle East with the 1,282,651 tons, the Black Sea bought the smallest amount of the exports with the 382,282 tons in 2017. Among these regions, the iron products are mostly exported from the Middle East countries. The top seaborne trade partner was Europe in the mineral group export shipments. Europe was the only region where petroleum product group was exported. The region where the fertiliser mostly delivered to Africa and the "other" group was mostly delivered to the Middle East in 2017. Table 7 shows the frequencies of shipments by regions.

Table 7: Frequencies of 2017 Export Shipments by Regions

Export 2017	Asia	Africa	Europe	American Continent	Black Sea	Middle East	Total
Iron	81	59	107	6	37	113	403
Mineral	4	8	15	5	55	9	96
Coal	4	-	2	-	-	-	6
Fertilizer	5	3	-	-	-	2	10
Petroleum	-	-	5	-	-	-	5
Cement	22	9	-	8	18	5	62
Other	48	10	14	4	7	36	119
Total	164	89	143	23	117	165	701

701 shipment was performed to these regions in 2017. The Middle East had the highest proportion of the shipments whereas American Continent had the lowest proportion in 2017 export shipment frequencies. However, Black Sea region bought the lowest amount of cargoes in ton basis.

4.3. Analysis of 2016 and 2017 Import Shipments of the Ports in Iskenderun Bay by Region and Cargo Groups

Unlike export shipments, import shipments were evaluated under the eight main groups as iron, mineral, coal, fertiliser, chemical product, petroleum product, cement, and "other" cargoes. The analysis of the 2016 import cargo group on a regional basis is shown in Table 8.

Table 8: Cargo Groups and Region-Based Analysis of the Import Shipments in 2016 (Ton basis)

Import 2016	Asia	Africa	Europe	American Continent	Black Sea	Middle East	Total
Iron	248,622	502,248	4,969,102	4,879,360	1,983,445	468,746	13,051,523
Mineral	-	6,600	15,215	2,608	46,170	5,034	75,627
Coal	875,824	304,944	917,541	4,648,422	842,871	-	7,589,602
Fertilizer	46,500	680,017	292,169	-	273,480	186,285	1,478,451
Chemical	-	13,619	69,363	-	22,933	85,342	191,257
Petroleum	-	125,641	228,552	74,970	88,749	250,675	768,587
Other	19,800	126,242	953,713	425,001	528,712	68,720	2,122,188
Total	1,190,176	1,759,31	7,445,655	10,030,361	3,786,360	1,064,802	25,277,235

According to Table 8, Middle East was the top trading partner in import shipment with the 10,648,802 tons while the smallest trading partner was Asia with the 1,190,746 tons in 2016. Europe took place on the top in iron, coal, and other cargo groups. The Black Sea was the region where the most significant number of mineral groups were bought by Turkey whereas Africa was in fertiliser group. Finally the Middle East had the biggest share in petroleum and chemical cargo groups in 2016. Table 9 illustrates the frequencies of the import shipments (2016).

Table 9: Frequencies of 2016 Import Shipments

Import 2016	Asia	Africa	Europe	American Continent	Black Sea	Middle East	Total
Iron	32	44	188	59	121	118	562
Mineral	-	3	9	1	19	2	34
Coal	8	5	21	41	33	-	108
Fertilizer	2	68	19	-	26	17	132
Chemical	-	3	14	-	10	20	47
Petroleum	0	10	7	2	3	13	35
Other	7	33	50	9	75	10	184
Total	49	166	308	112	287	180	1,102

Although the Middle East was the top trading partner in 2016 imports, the region had the second highest frequency. Europe had the most significant share in iron shipments and total import shipments

whereas the lowest shipment frequency belonged to Asia region. The analysis of the 2017 import cargo group on a regional basis is shown in Table 10.

Table 10: Cargo Groups and Region-Based Analysis of the Import Shipments in 2017 (Ton basis)

Import 2017	Asia	Africa	Europe	American Continent	Black Sea	Middle East	Total
Iron	46,399	732,433	5,533,510	3,550,322	2,184,008	235,771	12,282,443
Mineral	5,273	6,016	28,921	3,601	23,310	8,700	75,821
Coal	759,019	340,751	551,598	4,261,484	960,922	-	6,873,774
Fertilizer	151,605	858,368	175,153	32,100	87,851	39,364	1,344,441
Chemical	-	10,040	-	-	-	11,858	21,898
Petroleum	-	44,544	460,153	25,000	146,679	123,505	799,881
Other	50,639	169,387	392,158	341,913	1,219,430	32,290	2,205,817
Total	1,012,935	2,161,539	7,141,493	8,214,420	4,622,200	451,488	23,604,075

The top import trading partner was American Continent with the 8,214,420 tons import shipment while the smallest import trading partner was the Middle East with 805,488 tons in 2017. Europe placed on the top in iron and mineral cargo groups. Black Sea region had the biggest share of petroleum products and other cargo groups. While Africa placed on the top in fertiliser cargo group, Middle East had the most significant share in chemical cargo group. Table 11 shows the frequencies of 2017 import cargo shipments.

Table 11: Frequencies of 2017 Import Cargo Shipments

Import (2017)	Asia	Africa	Europe	American Continent	Black Sea	Middle East	Total
Iron	17	49	200	41	105	67	479
Mineral	1	2	14	1	8	2	28
Coal	8	4	14	37	51	-	114
Fertilizer	5	70	12	1	6	16	110
Cement	1	-	-	-	-	-	1
Chemical	-	2	-	-	-	2	4
Petroleum	-	9	14	1	5	6	35
Other	6	23	28	11	132	8	208
Total	38	159	282	92	307	101	979

Contrary to what is expected, Black Sea is the region where the cargoes were most frequently shipped. The Black Sea also has the highest import frequency in coal, and other cargo groups. The second highest shipment frequency belonged to Europe. Europe placed on the top in iron, mineral, and petroleum products cargo groups.

4.4. Analysis of Export Shipments at Specified Ports Located in Iskenderun Bay in 2016 and 2017

Figure 4 and Table 12 analyse the export shipments of specified ports within the Iskenderun Bay in 2016 and 2017.
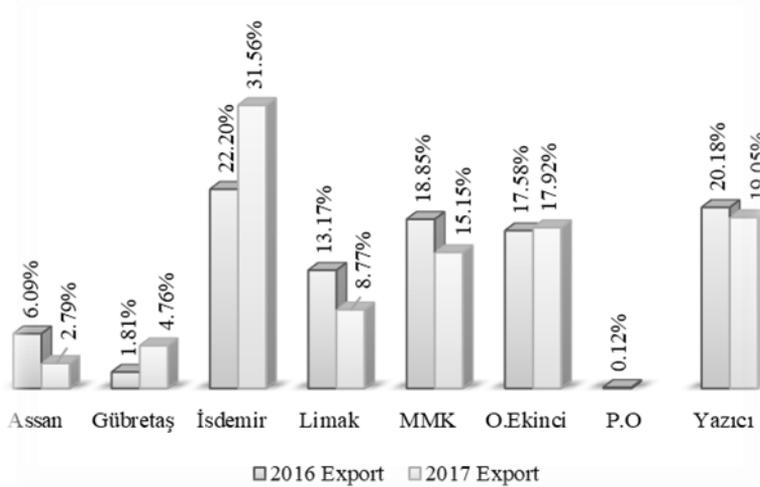
Figure 4: Analysis of Export Shipments of the Ports in 2016 and 2017

Percentages were calculated by considering only the amount of shipments of eight ports. The highest percentage of export shipment belongs to Isdemir Port both in 2016 and 2017. Petrol Ofisi Pier Port had the lowest percentage in 2016 shipments. The underlying reason for lowest percentage might stem from that Petrol Ofisi only serves to petroleum products. While the export volume of Assan Port, Limak Port, MMK Metalurji, and Yazıcı Port decreased, the rest of the ports increased in 2017.
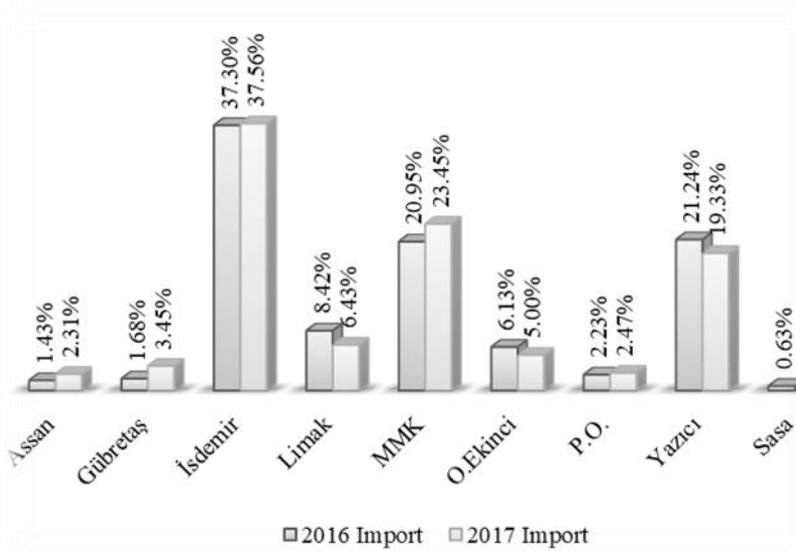
Table 12: Frequencies of the Export Shipments by Ports in 2016-2017

Years	Assan	Gübretaş	Isdemir	Limak	MMK	O.Ekinci	P.O	Yazıcı	Total
2016	68	7	142	88	114	93	1	202	715
2017	39	24	174	93	84	76	-	211	701
Total	107	31	316	181	198	169	1	413	1,416

Yazıcı Port has the highest shipment frequency both in 2016-2017. It means that the shipments were performed in the low amount of cargo but the more frequent shipments in comparison with the Isdemir Port.

4.5. Analysis of Export Shipments at Specified Ports Located in Iskenderun Bay in 2016 and 2017

Figure 5 and Table 13 analyse the import shipments of specified ports within the Iskenderun Bay in 2016 and 2017.

Figure 5: Analysis of Import Shipments of the Ports in 2016 and 2017

According to the Figure 5, Isdemir Port is the leader among the other ports in the 2016 and 2017. Ports showed a decrease in 2017 were Limak Port, Orhan Ekinci Pier, Yazıcı Port. Assan Port, Gübretaş Port, Isdemir Port, MMK Metalurji Port, and Petrol Ofisi Pier Port recorded increase in 2017 import shipments.

Table 13: Frequencies of Import Shipments by ports in 2016-2017.

Years	Assan	Gübretaş	Isdemir	Limak	MMK	O.Ekinci	P.O	Yazıcı	Sasa	Total
2016	56	46	188	135	303	119	20	201	34	1,102
2017	54	63	158	137	295	77	20	175	-	979
Total	110	109	346	272	598	196	40	376	34	2,081

MMK Metalurji Port had the highest shipment frequency in 2016 and 2017. The second highest shipment frequency belonged to Yazıcı Port. Alike in the 2016-2017 export shipment frequency, shipments of MMK Metalurji Port were performed in low quantity and more frequently. No 2017 data were recorded for Sasa Terminal. Therefore, it is impossible to make comments about Sasa Terminal.

5. CONCLUSION

Classification of mass data is necessary for further studies. Analyzing the seaborne trade data for the objective of classifying and transforming into a meaningful number provide an understanding of the export and import trends of the ports for both academicians and practitioners. With this study, it was classified and interpreted the mass statistical seaborne trade data of the Iskenderun region from the inductive viewpoint to understand the export and import tendencies.

Iskenderun region appeals to a wide area with its location and industry. Due to the presence of some ports and terminals, the region also has sufficient infrastructure to provide services to cargoes that may come from different regions. In the study, import and export cargoes were analysed by ports, regions and cargo groups. As a result of the analysis, iron products group was placed on the top in both 2016 and 2017. According to the data, export shipments of iron products group decreased from 2,925,286 in 2016 to 2,622,228 ton in 2017. Export shipments recorded a decrease of 532,697 tons in 2017. The import shipments were mostly in iron products group as in export shipments in 2016-2017. Cargo groups and region based analysis of the export shipments in 2016 showed that Africa took the first place with the 1,643,782 tons and iron products were the most exported group. The second highest amount of cargo belonged to the Middle East with the 1,100,703 tons. Iron products were the most imported cargo group of Middle East region in 2016. American Continent was the leader region in 2016 import cargo amount with the 10,030,361 tons. The lowest level of import shipments was recorded in Asia with the 1,190,746 tons. In 2017, regional import shipments showed that the most imported region was American Continent with the 8,214,420 tons whereas the least imported region was Asia. American Continent took the first place in 2017 import shipments with 8,214,420 tons. Turkey mostly imported coal group products from American Continent. Middle East region has the biggest share in 2017 export shipments. Isdemir Port has the biggest share in both export and import shipments. Compared to 2016, Isdemir Port has recorded an increase in export and import shipments in 2017. Generally, total cargo amount did not show the similarity with the shipment frequencies.

6. LIMITATIONS AND RECOMMENDATIONS FOR FURTHER STUDIES

Only port of loading and port of discharging information have been stated in the data of the ports. Especially in export shipments, it could not be determined the final discharging port of the vessels which goes to another port within the boundaries of Turkey. These data were disregarded. Additionally, there were too many missing values of import and export data received from IMEAK Chamber of Shipping Iskenderun Branch. These data were not included in the analysis. 2017 data of Sasa Terminal were not reached. The situation created a series of limitation to determine the final results of the export and import cargo shipments in specified ports. In future studies, this research can be developed with data from the other ports located in Iskenderun Bay. Hinterland analysis of all the ports in Turkey can be performed to determine the regional volume of the cargo groups and strategy formation for the regions. With this analysis, the efficiency of the new port investments can be made according to the cargo volumes of the region.

REFERENCES

Ateş, A. (2014). Türkiye'de liman özelleştirmeleri Iskenderun liman örneği. *Mustafa Kemal Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 11(25), 427-457.

Ateş, A., Esmer, S., Çakır, E. and Balcı, K. (2013). Konteyner terminallerinin göreceli etkinlik analizi. *Dokuz Eylül Üniversitesi Denizcilik Fakültesi Dergisi,* 5(1), 1-22.

Bayraktutan, Y. and Özbilgin, M. (2013). Türkiye iller düzeyinde karayolu yük trafiği dağılımının analizi. *Çukurova Üniversitesi İİBF Dergisi*, 17(2), 81-92.

Büyüköztürk, Ş. (2012). *Sosyal Bilimler için Veri Analizi El Kitabı.* Ankara: Pegem Akademi.

Çavdar, A.B. and Ferhatosmanoğlu, N. (2018). Airline Customer Lifetime Value Estimation Using Data Analytics Supported By Social Network Information. *Journal of Air Transport Management*. 67, 19-33.

de Lima, L.M., de Pelegrini Elias, L., Caixeta-Filho, J.V. and de Campos Coleti, J. (2016). Fertilizer Freight Rate Disparity in Brazil: A Regional

Approach Case Study. *International Food and Agribusiness Management Review*. 19(4), 109-128.

Elliott, N.R. (1968). Hinterland and foreland as illustrated by the port of the tyne. *Transactions of the Institute of British Geographers*. 47, 153-170.

Esmer, S. (2008). İzmir Alsancak limanı yük analizi. *Dokuz Eylül Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 10(4), 113-125.

Esmer, S. and Duru, O. (2017). Port governance in Turkey: the age of global terminal operators. *Research in Transportation Business & Management,* 22, 214-223.

Gokasar, I., Simsek, K. and Ozbay, K. (2015). Using Big Data of Automated Fare Collection System for Analysis and Improvement of BRT-Bus Rapid Transit Line in Istanbul. *Transportation Research Board 94th Annual Meeting. Washington, D.C*.

Hillebrand, J., Nierhoff, M.H. (2015). *Mastering RStudio-Develop, Communicate, and Collaborate with R*. Packt Publishing: *UK*

Horton, N.J. and Kleinman, K. (2015). *Using R Studio for Data Management, Statistical Analysis, and Graphics*. Second Ed. Tylor & Francis: *FL*

Idrus, M., Sitepu, G., Asri, S., Chairunnisa, A.S. abd Djalante, H. (2015). Identification of Role of Feeder, Collecting a Local Ports in Sulawesi Corridor in Supporting the National Connectivity. *International Journal of Engineering and Science Applications*. 2(2), 137-146.

Itoh, H. (2013). Market Area Analysis of Ports in Japan: An Application of Fuzzy Clustering. *Proceedings of the IAME 2013 Conference*. Marseille, France.

Jatain, A. and Ranja, A. (2017). A Review Study on Big Data Anaylsis Using R Studio. *International Journal of Computer Science and Mobile Computing*. 6(6), 8-13.

Kaushik, M. and Mathur, B. (2014). Data Analysis of Students Mark with Descriptive Statistics. *International Journal on Recent and Innovation Trends in Computing and Communication*. 2(5), 1188-1191.

King, W.R. and He, J. (2005). Understanding the role and methods of meta analysis in is research. *Communications of the Association for Information Systems*. 16(32), 665-686.

Kolaczyk, E.D. and Csardi, G. (2014). *Statistical Analysis of Network Data with R*. New York: Springer Science+Business Media.

Lewis-Beck, M.S., Bryman, A. and Liao, T.F. (2004). *The Sage Encyclopedia of Social Science Research Methods.* USA: Sage Publications.

Maksood, F.Z. and Achuthan, G. (2017). *Sustainability in Oman: Energy Consumption Forecasting Using R*. Indian Journal of Science and Technology. 10(10), 1-14.

Monie, D. G. (1987). *Measuring and Evaluating Port Performance and Productivity* (Monograph No:6), UNCTAD Monographs on Port Management.

Notteboom, T. (2008). *The Relationships between seaports and the inter-modal Hinterland in Light of Global Supply Chains: European Challenges*. Discussion Paper No. 2008-10 March.

Özkan, B. and Özkan Y. (2017). *R ile Programlama: İstatistik, Matematik, Yapay Zeka, Veri Madenciliği ve Grafik*. İstanbul: Papatya Yayıncılık Eğitim.

Pardali, A., and Stathopoulou, C., (2005), Port Competition: The case of Greek Port Industry. International Association of Maritime Economists Conference, 2005, Cyprus.

Seoane, M.J.F., Laxe, F.G. and Montes, C.P. (2013). Foreland Determination for Containership and General Cargo Ports in Europe (2007-2011). *Journal of Transport Jeography*. 30, 56-67.

Song, J.-R. and Jung, C.-M. (2009). The size effect of a port on the container handling efficiency level and market share in internation transhipment flow. *Maritime Policy & Management*, 36(2), 117–129.

Thompson, C.B. (1998). Descriptive Data Analysis. *Basics of the Research*. 28(2), 56-59.

Internet References

Assan Port. (2017a). *Hakkımızda.*
http://assanport.com/kurumsal/hakkimizda.aspx#mobile, Access Date:
01.10.2017.

Assan Port. (2017b). *Liman Özellikleri*.
http://assanport.com/LimanBilgileri/LimanOzellikleri.aspx, Access Date:
01.10.2017.

Diler Holding. (2017). *Yazıcı Liman.*
http://www.dilerhld.com/grup.asp?anagrup_no=5&grup_no=21, Access
Date: 10.10.2017.

DOĞAKA (TR Eastern Mediterranean Development Agency). (2013).
Yatırımcılar için Hatay Rehberi.
http://www.dogaka.gov.tr/Icerik/Dosya/www.dogaka.org.tr_175_IT5J66
WI_Yatirimcilar_Icin_Hatay_Rehberi.pdf, Access Date: 30.09.2017.

Ekinciler   (2017).   *Liman.*   http://www.ekinciler.com/ekinciler-demir-
celik.liman.1.46-tr.2.aspx, Access Date: 15.10.2017.

General Directorate of Railways Harbors ad Airports Construction.
(2009). *2. Interim Report of Transportation Coastal Structure Master
Plan Study*.
http://www.denizticaretodasi.org.tr/Shared%20Documents/Kiyi_AraRap
or2.pdf, Access Date: 23.01.2018.

Gübretaş. *Iskenderun Tesisleri*.
http://www.gubretas.com.tr/tr/icerik/294/1967/Iskenderun-tesisleri.aspx,
Access Date: 15.10.2017.

IMEAK DTO (Istanbul and Marmara, Aegean, Mediterranean and Black
Sea Regions Chamber of Shipping). (2015). *Deniz Sektörü Raporu 2015.*
http://www.denizticaretodasi.org.tr/Shared%20Documents/sektorraporu/2
015_sektor_tr.pdf, Access Date: 29.09.2017.

Isdemir (2017). *Rıhtım Bilgileri*
https://www.Isdemir.com.tr/kurumsal/urun-ve-hizmetler/hizmetler/,
Access Date: 15.10.2017.

ISO (2016). *ISO 500 Türkiye'nin 500 Büyük Sanayi Kuruluşu*. http://www.iso500.org.tr/500-buyuk-sanayi-kurulusu/2016/, Access Date: 25.01.2018.

Limakport (2017). *Tarihçe*. http://www.limakports.com.tr/tr/limakports/tarihce, Access Date: 01.10.2017.

Port Operators Association of Turkey (TÜRKLİM). (2017). *MMK Metalurji San. Tic. ve Liman İşletmeciliği A.Ş.* 2017, http://www.turklim.org/mmk-metalurji, Access Date: 15.10.2017.

R Project. What is R. https://www.r-project.org/about.html, Access Date: 07.03.2018.

TR Ministry of Public Works and Settlement. (2007). *Iskenderun Körfezi Kıyı Alanları Bütünsel Planlama ve Yönetim Projesi Raporu*. http://www.csb.gov.tr/dosyalar/images/file/12.pdf,   Access   Date: 29.09.2017.

TR Ministry of Science, Industry, and Technology. (2017). *Hatay İlinde Bulunan Organize Sanayi Bölgeleri.* https://osbbs.sanayi.gov.tr/citydetails.aspx?dataID=221, Access Date: 30.09.2017.

TR Ministry of Transport, Maritime Affairs, and Communication. (2014). *Deniz Ticareti 2014 Yılı İstatistikleri.* http://www.utikad.org.tr/images/BilgiBankasi/denizticareti2014yiliistatist ikleri-3881.pdf, Access Date: 22.01.2018.

TR Ministry of Transport, Maritime Affairs, and Communication. (2015a). *Deniz Ticareti 2015 Yılı İstatistikleri*. http://www.ubak.gov.tr/BLSM_WIYS/DTGM/tr/Kitaplar/20161116_165 220_64032_1_64480.pdf, Access Date: 22.01.2018.

TR Ministry of Transport, Maritime Affairs, and Communiations. (2015b). *Limanlar Geri Saha Karayolu ve Demiryolu Bağlantıları Master Plan Çalışması* http://www.aygm.gov.tr/BLSM_WIYS/DLH/tr/DOKUMAN_SOL_MEN U/Master_Plan_Calismalari/20151023_144226_10288_1_64.pdf, Access Date: 15.12.2017.

TR Ministry of Transport, Maritime Affairs, and Communication. (2017). *İstatistik Bilgi Sistemi Yük İstatistikleri.* https://atlantis.udhb.gov.tr/istatistik/istatistik_yuk.aspx, Access Date: 09.01.2017.

TSI (Turkish Statistical Institute). (2018). *Dış Ticaret İstatistikleri*. http://www.tuik.gov.tr/PreTablo.do?alt_id=1046,   Access   Date: 20.01.2018.