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A Strategic Solution to Turkey's Intermediate Goods Problem: Ceyhan Energy Specialized Industrial Zone

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Abstract

There is an on-going demand for energy from hydrocarbon compounds and intermediate goods in meeting the need for both production and intermediate products. The European Union and Turkey's need for energy and intermediate goods are provided by petroleum and natural gas imported from geographically nearest energy regions through pipelines. In this study, a strategic solution to demand for energy in Turkey is proposed. Furthermore, information about the energy status, the chemical sector and intermediate goods imports of Turkey is provided. Considerations are proposed on the capabilities of petrochemical plants to be established in Ceyhan Energy Specialized Industrial Zone (CESIZ) as an outlet of petroleum from Azerbaijan and Iraq and a potential logistic energy base in the Eastern Mediterranean region. Ceyhan Energy Specialized Industrial Zone, as the first energy zone in Turkey and the nearby region, is introduced and the investors are briefed on the petrochemical facilities planned to be established in the zone. The importance of intermediate chemical products produced by petrochemical plants to be established in Ceyhan Energy Specialized Industrial Zone in reducing the country's foreign trade deficit is revealed. Due to lack of studies conducted on CESIZ in the literature, this study would contribute to potential investors and academicians.

Keywords: Energy, Intermediate goods, Ceyhan energy specialized industrial zone (CESIZ), Strategic solution, Potential logistic energy

Türkiye'nin Ara Ürünler Sorununa Stratejik Bir Çözüm: Ceyhan Enerji İhtisas Endüstri Bölgesi

Öz

Hem üretim hem de ara ürün ihtiyacını karşılamada hidrokarbon bileşiklerinden ve ara ürünlerden enerji için devam eden bir talep vardır. Avrupa Birliği ve Türkiye'nin enerji ve ara ürünlere olan ihtiyacı, coğrafi olarak en yakın enerji bölgelerinden boru hatları aracılığıyla ithal edilen petrol ve doğal gaz ile sağlanmaktadır. Bu çalışmada, Türkiye'de enerji talebine yönelik stratejik bir çözüm önerilmiştir. Ayrıca, Türkiye'nin enerji durumu, kimya sektörü ve ara mal ithalatı hakkında bilgi verilmektedir. Ceyhan Enerji İhtisas Sanayi Bölgesi'nde (CESIZ) Azerbaycan ve Irak'tan petrolün çıkışı ve Doğu Akdeniz bölgesinde potansiyel bir lojistik enerji üssü olarak kurulacak petrokimya tesislerinin gelişime açık kapasiteleri üzerine

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dikkate alınacak hususlar sunulmuştur. Türkiye'de ve yakın bölgedeki ilk enerji bölgesi olan Ceyhan Enerji İhtisas Sanayi Bölgesi tanıtılmıştır ve bölgeye kurulması planlanan petrokimya tesisleri hakkında yatırımcılar bilgilendirilmiştir. Ceyhan Enerji İhtisas Sanayi Bölgesi'nde kurulacak olan petrokimya tesisleri tarafından üretilen ara kimyasal ürünlerin, ülkenin dış ticaret açığını azaltmadaki önemi açıklanmıştır. Literatürde CESIZ konusunda yapılan çalışmaların yetersizliği nedeniyle, bu çalışma potansiyel yatırımcı ve akademisyenlere katkı sağlayacaktır.

Anahtar Kelimeler: Enerji, Ara ürünler, Ceyhan enerji ihtisas sanayi bölgesi (CESIZ), Stratejik çözüm, Potansiyel lojistik enerji

1. INTRODUCTION

Energy is one of the vital requirements for today's world, and it has an unquestionable crucial task in industrial developments, economic progress and most importantly in human life [1-4]. It is realized universally that energy is not only inevitable requirements for internal dynamics of the countries but also it is a strategic issue which influences universal affairs, for example, political debates as well as military conflicts. In recent years, global energy demand has shown increase depending on the emerging technology and population growth, and at the same time, unfortunately, fossil fuels have been sharply declining. In this respect, the global warming being the threat of climatic change, efficient usage of energy sources, greenhouse-gas (GHG) emissions based on fossil energy consumption and use of renewable energy resources have become most attractive issues in the present decade [5-9].

In spite of the increased use of renewable energy resources, the need for hydrocarbon compounds in meeting energy demand does not diminish. Today, along with the increase in production which in turn stimulates the need for energy, the dependence on hydrocarbon compounds is multiplied. There is an on-going demand for energy from hydrocarbon compounds and intermediate goods in meeting the need for both production and intermediate products. Both developed and developing countries tend to prove their needs for energy and intermediate goods through imports to a large extent. Having an advanced economy, Turkey's need for energy and intermediate goods are also supplied through imports. Since the petrochemical plants with limited numbers in the country are not able to meet the country's needs for intermediate chemical goods, imports of such products of the chemical sector largely account for the current account deficits. Being a geographical bridge between the countries with 70% of the world's petroleum and natural gas and the countries with energy needs, Turkey has risen to prominence, not only in the energy supply and security of the European Union but also in energy projects in the Middle East, Caucasus and Eastern Mediterranean regions. Despite the increasing use of renewable energy resources, the supply of energy is still being provided from carbon fuels. According to 2016 BP World Energy Statistics Report [10], petroleum has increased its market share for the first time since 1999, while maintaining 32.9% of world energy consumption as the world's largest fuel. Turkey's petroleum consumption increased by 12.5% in 2015, and it has a share of 0.9% in the world petroleum consumption. In natural gas, however, the market share of primary energy consumption has reached 23.8%. Renewable energy production in Turkey increased by 34.4% in 2015, accounting for 1% of the world's total renewable energy output.

According to the data compiled from Turkish foreign trade statistics, the total imports reached at USD 50.4 billion in January-March 2017 period in Turkey. The USD, 9.1 billion portion of this figure, consists of such chemical products summarized as energy imports, namely, "mineral fuels, mineral oils and products derived from their distillation, bituminous substances, and mineral waxes." Turkey's energy imports, which amounted to USD 6.5 billion in the first quarter of last year, have increased by 39% to USD 9.1 billion during the same period of this year. Nonetheless, Turkey's electricity imports have declined by 36% (USD 30.6 million) in the January-March period. In the January-March period of last year, USD 48.9

million was paid for electricity imports. In the same period of 2017, this figure has decreased by 36% (USD 30.6 million). Thus, the amount of USD 17,492,847 has remained in the country [11].

The decline in electricity imports is offset by resources such as hydroelectric power plants, coal and natural gas conversion plants and renewable energy that have been established in Turkey over the past 15 years [12]. Most of the countries with energy resources are located in Eurasia and the Middle East. The transportation of these resources to consumers is mostly carried out with pipelines. The supply and safety of energy in those pipelines have become major contemporary problems. Figure 1 indicates the distribution of electricity energy generated on June 30, 2017, in Turkey in accordance with the resources. Throughout the production of electric energy, some discrepancies in the use of resources can be seen in terms of the daily demand. According to the data in Figure 1, on June 30, 2017, the electricity energy is generated from natural gas (40.35%), hydropower (21.8%), imported coal (16.24%), and lignite (12.93%). In general, the imported coal and lignite-based plants are on the front rank in meeting the need for electricity energy followed by hydroelectric power plants. Therefore, the electricity production values obtained from natural gas conversion plants vary between 40% and 30% within the year [13].

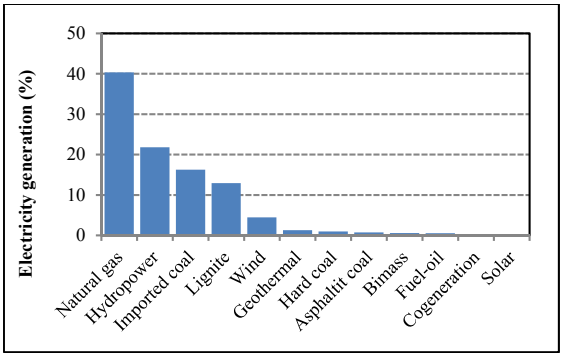

Figure 1. Distribution of electricity generation in terms of resources on June 30, 2017

Energy geopolitics of a country or region can be defined by its geographical location and its role for supply, transit or demand for energy. Strategically located between two continents, Turkey is an important country that holds an important place in the oil and gas and its import dependency on regional energy security. At present, Azerbaijani and Kurdish oil is transmitted across the Eastern part of the country to Ceyhan by the Mediterranean Sea. Russian and Azerbaijani oils are transmitted to the Western markets through the Turkish Straits of the Bosporus and Dardanelles waterway. Natural gas is only available for domestic use from Russia, Iran and Azerbaijan. Some natural gas from the former Soviet republics in Central Asia is also transmitted through Russia. For the European Union (EU), diversification of natural gas supplies and reduction of role of Russia as producer and transit country seem to be an important strategy [14].

As seen and known, Turkey is situated at the crossroads of Asia and Europe, with most of its territory located in south-west Asia and a small part in south-east Europe (Eastern Thrace). Turkey is set to become an anchor of the Southern Gas Corridor, transporting natural gas from Azerbaijan to Turkey and the European Union by 2018/19 through the Trans-Anatolian Gas Pipeline (TANAP) and the Trans-Adriatic Pipeline (TAP), from Turkey across Greece and Albania to Italy. Turkey is implementing new energy targets under the Vision 2023, its economic development strategy to 2023, the year that marks the 100th anniversary of the Republic of Turkey. The energy goals to 2023 include the promotion of indigenous energy resources, such as coal (lignite) and a 30% share of renewable energy in the electricity mix [15].

To achieve the goals of energy in 2023, a strategic solution to demand for energy in Turkey is proposed in this study. Furthermore, this study provides information about the products to be produced at petrochemical plants established in Ceyhan Energy Specialized Industrial Zone as a solution to the country's need for intermediate goods. Ceyhan Energy Specialized Industrial Zone (CESIZ), the first energy zone in Turkey, is introduced and the information is provided for investors about petrochemical plants planned to be established. The importance of Ceyhan Energy Specialized Industrial Zone (CESIZ) in reducing

the foreign trade deficit by meeting the chemical demands with intermediate goods produced at the petrochemical plants planned to be established in the country is highlighted. Due to the absence of previous studies on CESIZ in the literature, this study is singled out to be the first one to serve as a contribution to both potential investors and academicians.

2. TURKEY'S ENERGY STRATEGY REVIEWS

Figure 2 presents the location of electricity generation plants in Turkey [15]. Figure 3 presents the distribution of electricity generated in Turkey by resources in 2016. In general, the rate of distribution of resources used in daily generated electricity is approximately the rate of distribution of resources used in the annual production of electricity energy. The electricity production values in accordance with years are shown in Figure 4. Electricity production in Turkey in 2016 was 274,407.7 GWh [13].

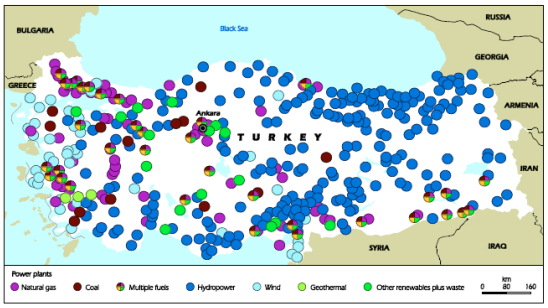

Figure 2. Location of electricity generation plants in Turkey [15]

As can be seen, imported natural gas and coal have crucial roles in the production of electricity energy. While Turkey's natural gas needs are met through pipelines to a large extent, a small portion is covered by CNG provided from Algeria [16,17].

Table 1 provides information on natural gas imports for the last ten years. As seen in Table 1, most of the natural gas imports are provided by Russia. The same situation applies to the European Union countries. In 2016, natural gas imports decreased by 4.28 %, 52.94% of the natural gas imports made in 2016 are from Russia, while 16.62% from Iran, 13.98% from Azerbaijan, 9.24% from Algeria, 2.63% from Nigeria, and 4.58% from other countries. 83.44% of imported natural gas is transported through pipelines and 16.46% in the form of LNG. 36.06% of natural gas imported in 2016 is consumed in Conversion/Cycle Sector, 30.38% in Industrial Sector, 25.05% in residence and 6.13% in Official Departments and Businesses [18].

Figures 5 and 6 show the natural gas and oil infrastructures in Turkey [15]. Nowadays, energy supply and safety have been brought forth. The natural gas distress experienced by the European Union as the world's largest energy consumer between the years 2006-2009 due to the problems

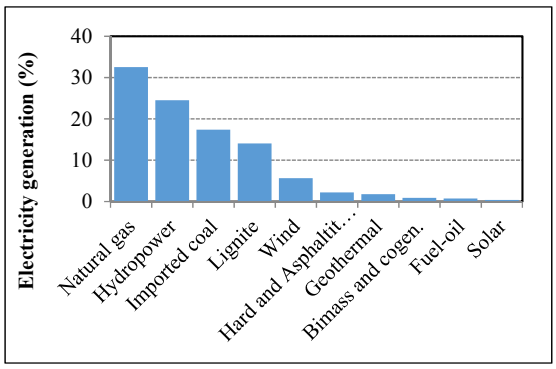

Figure 3. Distribution of electricity energy generation in terms of resources, 2006

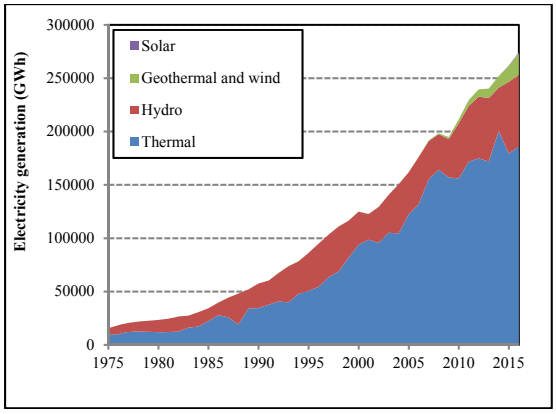

Figure 4. Electricity generation values in Turkey (TETC, 2014)

Figure 5. Natural gas infrastructure in Turkey [15]

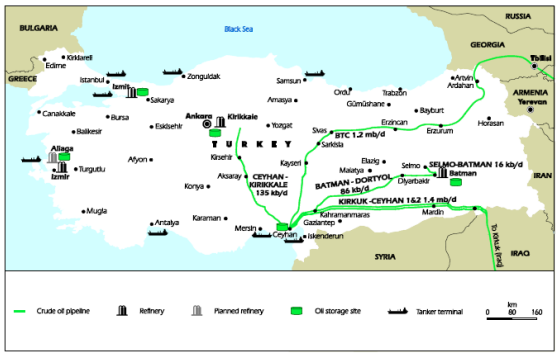

Figure 6. Oil infrastructure in Turkey [15]

with Russia as the main supplier would be the perfect example [16,19]. Having experienced blackouts, European Union has issued a number of directives to enable security of energy supply and started to develop policies for alternative energy sources. Directives issued by EU concerning Electricity (2009/72/EC) and Natural Gas (2009/73/EC) have been enacted to set up perfect competition market, allow consumers to freely choose among suppliers, establish regulations by independent authorities, improve cross-border trade, enable all parties to directly access to the network and provide security of supply (EU). The recent blackouts showed the importance of diversifying energy sources once again. Currently, European Union imports natural gas from diverse supplies, while Russia and Norway are main suppliers [10].

In addition, Algeria and Libya export CNG to EU. Despite the recent blackouts, European Union is still dependent on Russia for natural gas. In 2016, Russian state-owned Gazprom provided 34% of total natural gas consumption of European Union. According to BP's report, Russia will remain as the main natural gas supplier of EU until 2035 [10,20]. TANAP Project is the most important natural gas pipeline under construction besides the present supply lines. Trans Anatolian Natural Gas Pipeline Project consists of transporting natural gas produced in Azerbaijan's Shah Deniz gas field and other regions in the southern Caspian Sea primarily to Turkey and then to Europe. In the first stage of the project, the initial capacity of the pipeline that will supply Turkey with natural gas is expected to be 15.75 billion cubic meters and additional pipelines are planned to be constructed based on the purchase commitment of EU countries. Furthermore, with Southern Gas Corridor Project developed as part of EU INOGATE (Interstate Oil and Gas Transport to Europe), it is planned to bring natural gas from Azerbaijan's Shah Deniz Phase-1 region to Europe through Turkey and Greece. This is one of the most complex gas chain project developed in the world. It stretches more than 3.500 kilometers, crossing several countries and involving a number of major energy companies. A total of 674.68 million standard cubic meters natural gas was exported in 2016 through this pipeline. Besides these projects, further works and negotiations are still ongoing concerning the transport of natural gas from Israel, Iraq, Jordan and Egypt to Europe through Turkey. In addition to the existing pipelines, transportation of natural gas to be extracted from the Eastern Mediterranean via new planned pipelines to the European Union is an important choice in terms of natural gas supply diversity and security [21]. It is the most important of the planned routes in the transportation of hydrocarbon compounds to European Union countries which would be extracted from the Eastern Mediterranean in the coming years [22]. This study emphasizes the importance of Ceyhan as an energy supply base for East Mediterranean in addition to its role as an important access point to the world for petroleum and natural gas products of Caspian Sea and Middle East. The study also introduces Ceyhan as an important logistic base and underlines its importance in terms of energy supply and security for the transport of natural gas that will

be produced in East Mediterranean to European Union.

3. INTERMEDIATE GOODS IN TURKEY

Raw materials are the materials used by changing the physical or chemical structure of the product while the intermediate goods are the goods used as inputs in the production of other products. The value-added expressed as the value included to the product at every stage of production is calculated by deducting the value of every input (intermediate goods, raw materials, service, electricity, water, etc.) purchased from the production value. According to this definition, the value-added is the difference between the output value in a production process and the total value of the intermediate inputs used. In the event that the procurement of intermediate goods and raw materials and other inputs that make up the production cost is provided from companies producing other goods and services in the country, all value-added created would remain in that country. Otherwise, the value- added created in commensurate with the imported inputs and services would be transferred to the other manufacturers located abroad. From this point of view, in addition to making high value-added production, where the value- added remains is also very important for the economy. The technological structure of the Turkish manufacturing industry is generally inclined towards the production of low and medium-low technology products. In the manufacturing industry, the shares of medium-high and high technology products are 24.3% and 2.4%, respectively.

Upon considering the technological structure of exports of manufacturing industry, it is observed that a significant part of Turkey's exports consist of low and low-medium technology products, while the share of high-technology products is low. It is an important issue from where raw materials and intermediate goods utilized in production are procured. Procurement of used inputs from domestic manufacturers enables the created value-added to remain in the country as well as it contributes to the competitiveness along with the investments to be made in these sectors. Otherwise, the production with imported inputs from abroad would cause the value-added to be transferred abroad. This situation would have an adverse effect on the foreign trade and hence the current account balance and would weaken the international competitiveness of companies that produce either intermediate goods or consumption goods. The structural status of the Turkish manufacturing industry and the foreign-dependent structure of inputs that the leading sectors are using regarding production value are the main causes of foreign trade deficits. The high levels of shares of goods and services imported from abroad in the production chain cause not only revenue loss in terms of the related sector but also the transfer of foreign exchange in terms of the national economy. The high import dependency of the production leads to a trade deficit as well as an adverse impact on the balance of payments. The sustainability of the production structure in that direction would ensure that the current account deficit becomes permanent on the country's agenda. Therefore, countries make the production and investment of intermediate goods and inputs that their industries need particularly tempting by implementing different incentive policies.

Along with the increase in production, the imports of intermediate goods also increase which, in turn, worsen the current account deficit and pose a risk for sustainable growth. Obviously, it is inevitable to raise the domestic contribution rate in production, especially intermediate goods production, in order to reduce both the current account deficit and the necessary high growth rates. In Table 2, technological classes and values in the import of intermediate goods are given. Medium-high and low technology products play an important role in imported intermediate goods. Upon considering the sectoral distribution of intermediate goods imports, the energy resources are seen to have a share of 36% followed by the chemical sector with a share of 22.2%. The chemical sector is followed by the metal and automotive sectors with shares of 19.4% and 7%, respectively. The total shares of these three sectors in the imports of intermediate goods correspond to approximately 50% of total imports. In Table 3, the import values of the top 15 imported

Table 1. The amounts of natural gas imported by Turkey according to exporting countries [17]

Country	Russia		Iran		Azerbaijan		Algeria		Nigeria		Others*		Total	Percentage Change Over Previous Year
Years	Quantity ($)	Share (%)	Quantity ($)	Share (%)	Quantity ($)	Share (%)	Quantity ($)	Share (%)	Quantity ($)	Share (%)	Quantity ($)	Share (%)	Quantity ($)	
2006	19,316	63.92	5,594	18.51	0	0	4,132	13.67	11,100	3.64	79	0.26	30,221	-
2007	22,762	63.51	6,054	16.89	1,258	3.51	4,205	11.73	1,396	3.89	167	0.47	35,842	18.60
2008	23,159	62.01	4,113	11.01	4,580	12.26	4,148	11.11	1,017	2.72	333	0.89	37,350	4.21
2009	19,473	54.31	5,252	14.65	4,960	13.83	4,487	12.51	903	2.52	781	2.18	35,856	-4.00
2010	17,576	46.21	7,765	20.41	4,521	11.89	3,906	10.27	1,189	3.13	3,079	8.09	38,034	6.08
2011	25,406	57.91	8,190	18.67	3,806	8.67	4,156	9.47	1,248	2.84	1,069	2.44	43,874	15.35
2012	26,491	57.69	8,215	17.89	3,354	7.3	4,076	8.88	1,322	2.88	2,464	5.37	45,922	4.67
2013	26,212	57.9	8,730	19.28	4,245	9.38	3,917	8.65	1,274	2.81	892	1.97	45,269	-1.42
2014	26,975	57.76	8,932	18.13	6,075	12.33	4,179	8.48	1,414	2.87	1,689	3.43	44,262	8.82
2015	26,783	55.31	7,826	16.16	6,169	12.74	3,916	8.09	1,240	2.56	2,493	5.15	48,427	-1.70
2016	24,540	52.94	7,705	16.62	6,480	13.98	4,284	9.24	1,220	2.63	2,124	4.58	46,352	-4.28

intermediate goods used in the chemical sector in 2016 are given. These products constitute 50% of the imports of intermediate goods in the chemical sector. Table 4 indicates the top 15 high technology products imported as intermediate goods. Upon examining, these products are seen to belong to the health sector [11].

4. CHEMICAL SECTOR IN TURKEY

The Turkish chemical industry mainly consists of facilities for the production of various chemical intermediate and consumption products such as petrochemicals, soaps, detergents, fertilizers, pharmaceuticals, paint and varnishes, synthetic fibers and soda. Companies operating in the sector differ in terms of their scales and capital resources. Although a large number of companies operating in the sector are small and medium-sized enterprises, large-scale firms and multinational corporations operate as well.

The chemical sector is an import-dependent sector. 70% of the used intermediate goods are imported, and 30% are supplied with domestic production. 90% of the main input of plastics production is provided by the petrochemical sector.

Table 2. Importing technology classifications and import values of the imported intermediate goods [11]

Technology Classification	Share (%)	Import Value ($)
High Technology	8	9,311,050.220
Medium-High Technology	36	42,226,271.149
Medium-Low Technology	33	39,410,721.741
Low Technology	11	12,535,038.467
Other	12	14,575,211.726
Total	100	118,059,713.545

The petrochemical sector is a large scale, capital, and technology-intensive sector. The plastics and rubber sector is a highly import-dependent (over 90%) sector. Since the chemical sector is a capital-intensive industry, the labor intensity is low. Therefore, approximately 300.000 people are employed in the chemical sector.

Table 3. Top 15 products of chemical industry imported as intermediate goods [11]

	HS CODE	PRODUCT NAME	IMPORT VALUE ($)	TECHNOLOGY CLASSIFICATION
1	271019	Other Oils and Preparations	6,626,092.030	Medium-Low Technology
2	390210	Polypropylene (In Primary Forms)	1,821,032.284	Medium-High Technology
3	390120	Polyethylene Having a Specific Gravity of 0.94 or More	976,95.938	Medium-High Technology
4	390410	Polyvinyl Chloride (Uncompounded) (Pvc)	618,832.497	Medium-High Technology
5	390110	Polyethylene Having a Specific Gravity of Less Than 0.94	979,968.739	Medium-High Technology
6	390230	Propylene Copolymers (In Primary Forms)	497,436.907	Medium-High Technology
7	382490	Other Chemical Products Used in Chemical and Affiliated Industries	524,670.364	Medium-High Technology
8	400122	Technically Specified Natural Rubber (Tsnr)	160,302.037	Medium-Low Technology
9	390319	Styrene Polymers; (Other Than Expansible Polystyrene), in Primary Forms	304,827.837	Medium-High Technology
10	390720	Other Polyethers (In Primary Form)	437,851.348	Medium-High Technology
11	281410	Pure Ammonia	167,534.187	Medium-High Technology
12	320611	Titanium Dioxide-Based Pigment and Preparations	247,425.397	Medium-High Technology
13	390760	Polyethylene Terephthalate (In Primary Forms)	198,751.744	Medium-High Technology
14	310210	Urea	507,696.322	Medium-High Technology
15	271311	Petroleum Coke (Non-Calcined)	240,794.282	Medium-Low Technology

Table 4. High technology products of chemical industry imported as intermediate goods [11]

	HS CODE	PRODUCT NAME	IMPORT VALUE ($)	TECHNOLOGY CLASSIFICATION
1	300210	Antisera and Other Blood Fractions and Modified Immunological Products	1,017,040.845	High Technology
2	300220	Vaccines Used for Humans	156,455,555	High Technology
3	294190	Other Antibiotics, Their Derivatives; Salts	114,036.903	High Technology
4	293359	Other Pyridine/ Piperazine Ring Containing Compounds	102,120.934	High Technology
5	300390	Other Medicaments Which Have Been Mixed Together for Therapeutic or Prophylactic Uses (Not Put Up in Measured Doses)	76,129.342	High Technology
6	300210	Antisera and Other Blood Fractions and Modified Immunological Products	58,749.513	High Technology
7	300230	Vaccines Used for Animals	45,993.493	High Technology
8	300290	Human and Animal Substances Prepared for Therapeutic Uses for Human or Animal	41,905.116	High Technology
9	300630	Opacifying Preparations for X-Ray Examinations	38,983.319	High Technology
10	294110	Penicillins and Penicillanic Acid Derivatives; Salts	31,774.755	High Technology
11	293999	Other Herbal Alkaloids Extractions, Esthers and Derivatives	30,106.893	High Technology
12	300190	Other Human or Animal Substances Prepared for Therapeutic or Prophylactic Uses	27,882.677	High Technology
13	292429	Other Cyclic Amides and Their Derivatives, Salts	25,972.116	High Technology
14	300660	Hormone/Spermicide-Based Contraceptive Chemical Preparations	25,761.129	High Technology
15	293500	Sulfonamides	21,310.704	High Technology

The share of chemical sector employment in the manufacturing industry is about 9%. Since the chemical industry is a capital/technology intensive sector, having a weighted capacity utilization rate of 75.3% within the course of last four years, it involves a relatively low labor intensity. The share of the sector in manufacturing industry employment is an average of 8% in the last five years, while its share in the total value- added created in the manufacturing industry corresponds to 13.77%. Chemical sector products have a wide range of variety. The sector involves mineral fuels/oils (with HS Code 27), inorganic chemicals (with HS Code 28), organic chemicals (with HS Code 29), pharmacy (with HS Code 30), fertilizer (with HS Code 31), paint, paste, varnish (with HS Code 32), perfumery and cosmetics (with HS Code 33), soap (with HS Code 34), albuminoid matter (with HS Code 35), gunpowder, explosives (with HS Code 36), photography, (with HS Code 37), various chemicals (with HS Code 38), plastic and plastic products (with HS Code 39) and rubber and rubber products (with HS Code 40) [23].

The chemical industry, as an industrial entity that provides many sectors with intermediate goods, has an important role in the production as well as in foreign trade. There are only a few products manufactured in the chemical sector without using raw materials. In this context; it provides many fields of industry with both final and intermediate products such as leather, textiles, construction (pipes, sheets, doors, windows, etc.), agricultural chemicals, synthetic fertilizers, veterinary medicines, synthetic fibers, soap, detergent, cleaners, plastic raw materials, human medicine industry, cosmetics industry, adhesives, joints, fillers, insulating materials, photographic materials, gunpowder and explosives.

The main ingredient of petrochemical products, namely, “naphtha” is one of the products produced from crude oil. The process involves the production of naphtha and LPG from crude oil and the production of ethylene, propylene, benzene, paraxylene, etc. and the production of intermediary goods of low density polyethylene (LDPE), high density polyethylene (HDPE), polypropylene, etc. out of these raw materials for such sectors as plastic and rubber. The major chemicals constitute approximately 38% of the chemical industry in the world, while special chemicals make up 27%, pharmaceuticals account for 25%, and consumer chemicals comprise 10% [24]. Furthermore, recent studies in the fields of nanotechnology, biochemistry, catalysis, genetics, organic chemistry and polymer chemistry in the world chemical sector have begun to show positive effects. On the other hand, the total revenues of the top 30 major chemicals-producing countries are equal to 2,784 billion euros. China, USA, and Japan are in the front ranks 30.5%, 14.6%, and 5.6% shares, respectively [24]. Germany is the largest chemical producer in the EU, followed by France, Italy and the Netherlands. The total share of these four major producers in total EU chemicals sales is 62.6% [25,26].

When the capacity of existing refineries in Turkey and the imports data of the chemical industry are examined, the necessity of constructing a few modern facilities in the country becomes apparent. In this respect, the establishment of refinery and petrochemical facility where the petroleum pipelines that come up to Ceyhan region have an outlet toward the world would be an important factor in reaching the targets of the country in 2023 and in reducing its the foreign trade deficit. Turkey would inevitably become closely involved with economic and also political decisions, especially in the Middle East and the Eastern Mediterranean regions. In every aspect of modern life, the effects of chemicals are deeply felt. The chemical sector is in the manufacturing sector that affects different manufacturing sectors. The chemical industry can be evaluated under three main groups: basic chemicals, petrochemical product derivatives and basic inorganic products. Basic chemicals, which are produced in high quantities and have a relatively low value-added, have a wide variety of use in chemical and other manufacturing industries. It is an easy to exchange among a large number of manufacturers who produce the same product of basic chemicals, which are produced using continuous production technique and sold entirely according to the chemical component grade. Demand for basic chemicals is generally in line with economic growth. Specialty (performance)

chemicals are compounds that are produced in low quantities and are formulated with sensitive chemicals that have a relatively high value-added and are specially produced for contributing to product performance in different sectors. Unlike basic chemicals, specialty chemicals are produced by discontinuous production technique and evaluated according to their functions, not according to their contents. They are produced either especially for end-user sectors such as electronics, textile, paint, agriculture, and petroleum or for giving properties such as adhesiveness, non-flammability to finished products which are produced in different sectors. Consumer chemicals include various products such as soap, detergent, shampoo, perfume, cosmetics that are produced directly for the consumer. Taken as a whole, the chemical sector uses about one-third of its production as input for its own production. Besides from its own use, the consumer chemicals segment, including cleaning and cosmetics, is the field where the production of chemical sector is mostly utilized (30%) followed by the service sector (17%), basic metals, mining, machinery and electronics sector (9%), agriculture sector (7%), textile sector (6%), construction sector (5-6%), and automotive sector (5%). The production of basic chemicals in petroleum refineries and petrochemical plants, which have access to low-cost and abundant intermediate products, is also a determining factor in the investment of specialty chemical producers who utilize these products as inputs in high value-added production. A considerable amount of the incoming petroleum through the pipelines located in Turkey is exported while only a small portion is processed in the limited number of domestic refinery facilities.

Among totally four refineries in Turkey, TÜPRAŞ refineries located in İzmit and İzmir operate with processing capacities of 11 million tons; İzmir Star Refinery operates with 10 million tons; Kırıkkale Refinery with 5 million tons; Batman Refinery with 1.1 million tons [27,28]. Petkim, formerly a public entity and privatized in 2007, is the largest petrochemical company in Turkey. 51% stake in Petkim's equity capital was acquired by Socar-Turcas for USD 2.04 billion. 10% of the company is still owned by the Privatization Administration, and the remaining 39% is publicly traded on the Istanbul Stock Exchange [29].

The annual production capacity of Petkim's Aliağa petrochemical plant located in Izmir is 3.2 million tons. Petkim's product range includes LDPE, HDPE, PVC and PP products, masterbatches, fibers, and aromatics. These products are important regarding construction, electricity, electronics, packaging, textile as well as medicine, paint, detergent and cosmetics sectors [23]. Petkim procures its main input "naphtha" in the production of the related intermediate products utilized by many sectors either from TUPRAŞ, which is the only domestic producer in Turkey or from imports. Similar to Petkim, Tüpraş, formerly a public organization and privatized in 2005, is the only entity that processes crude oil in Turkey and continues its activities in İzmit, İzmir, Kırıkkale and Batman petroleum refineries. Products manufactured by the company consist of LPG, gasoline, light and heavy naphtha, kerosene, light and heavy diesel and fuel oil [27,28]

5. CEYHAN ENERGY SPECIALIZED INDUSTRIAL ZONE (CESIZ)

Ceyhan Energy Specialized Industrial Zone (CESIZ) is established in southern Turkey, near Ceyhan district on the Mediterranean coast. CESIZ is established on the scale of 1341 hectares within the coordinates indicated in Official Gazette of the Republic of Turkey dated October 17, 2007, numbered 26673. From this date forward, necessary studies have been started, and the processes are being carried out by the Ministry of Science, Industry, and Technology. CESIZ is advantageous regarding its position in the Mediterranean.

CESIZ is adjacent to BOTAS and BTC facilities where the Baku-Tbilisi-Ceyhan (BTC) and Kirkuk-Yumurtalık pipelines meet the Mediterranean. In 2016, 26.1 million tons (189.4 million barrels) of crude oil is transported through the Kirkuk-Yumurtalık pipeline. The Baku-Tbilisi-Ceyhan (BTC) Crude Oil Pipeline transports the petroleum produced in the Caspian region (mainly Azerbaijani petroleum) to Ceyhan via Azerbaijan and Georgia.

Through this pipeline, 253.976 million barrels of crude oil is transported in 2016 (BOTAS 2016).

As shown in Figure 7, the near proximity of CESIZ to the facilities through which BTC and Yumurtalik-Kirkuk petroleum is distributed to the world makes it advantageous for chemical plants to have access to crude oil as the main source of raw materials. CESIZ is adjacent to Ceyhan Organized Industrial Zone and Yumurtalik Free Zone, away from Osmaniye Organized Industrial Zone and Dörtyol and İskenderun harbors. It stands out as a developed region regarding transportation possibilities by means of its harbor which is expected to further develop the investments inflows along with the access to the sea as well as developed highway networks.

All statutory permits have been obtained for the establishment of a refinery named Adana Eastern Mediterranean Refinery near to Ceyhan Energy Specialized Industrial Zone (CESIZ). Besides incoming crude oil via BOTAS and BTC pipelines, processing of the crude oil transported through Samsun-Ceyhan Pipeline Project, which is called TAPCO Pipeline Project initiated by a private company, is aimed. CESIZ is in an attractive position for investments thanks to its potential of USD 600 billion worth of business and 120 million consumers. CESIZ is managed by Adana Chamber of Industry. Adana Chamber of Industry has conducted a research study as guidance for potential investors of petrochemical plants to be established in CESIZ [30]. This study provides information about the world and the Turkish economy and then about regions with different geographical features in which chemical plants are clustered. In the study, besides the economic data, weak and strong aspects, as well as the necessities of the region, are put forward. Also, the course of action and action plans have been presented for CESIZ to assure success. In this study, the products needed to be produced in the chemical plants to be established in the region, as well as the chemical sector and data on intermediate products in Turkey, are examined. Another advantage of CESIZ involves its status of coverage within the scope of incentives for strategic and large-scale investments provided by the State.

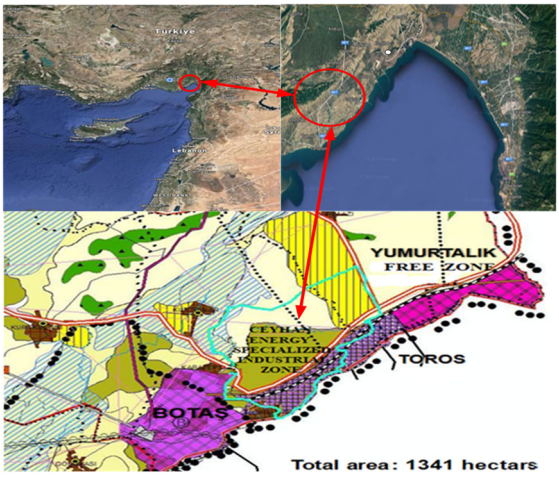

Figure 7. Ceyhan Energy Specialized Industrial Zone (CESIZ)

Petrochemicals being produced in an unprecedented way in the petrochemical industry can be either used by the petroleum extraction /refining departments of the company or sold directly to outsiders. There are a lot of inputs and outputs in the production process. Most of the time, there exist by-products that are needed by another section or company in the production process. In the petrochemical sector, the customers of the companies can be their suppliers, competitors, and partners. The ability to jointly use non-key assets to reduce capital costs is another distinguishing feature that can be applied by clusters in the petrochemical industry. Reducing the capital expenditures of chemical factories is a stunning factor for attracting investments to the region. In different geographical regions of the world, there are petrochemical clusters established for different purposes. The reasons for the formation of clusters vary from one geographical region to another. While these causes appear as cost-effectiveness in order to compensate for cost disadvantages concerning raw material and other inputs in Europe, there are rather seen as the use of raw material resources and cost advantages for value chain steps with higher value-added in the Middle East. In Asia, however, the purpose of establishing petrochemical clusters can be translated as the dependence on imports of petrochemicals and the efficient production to reduce the foreign trade deficit. Furthermore, the petrochemical clusters being established by more

and more countries have become a necessity for competitiveness in the international arena rather than merely an opportunity to maintain a competitive advantage. As a result, petrochemical clusters are being established even in geographical areas where petrochemical clusters are already present [30].

6. CONCLUSION

In the petrochemical sector, it is possible to further reduce costs and delivery times and increase the product variety by utilizing the land, air and marine lines in combination. The role of the state in petrochemical cluster management is also important. Practice partnership is among the successful examples in this area. Upon examining successful petrochemicals clusters over the world, the first stage includes raw material supply and security. Then petrochemical plants where production would take place should be identified to be clustered in a whole in order to diversify the products. The implementation of these strategic stages is considered to increase the chances of success for Ceyhan Energy Specialized Industrial Zone. The reduction of the country's need for intermediate goods and the share of this need in imports would only be possible by producing chemical products of medium-high and medium-low technologies. Appropriate petrochemical plants should be established to produce these products and new chemical products. In addition, production of high technology products to be used in health and basic chemical sectors should be planned. Its close proximity to the Eastern Mediterranean region where natural gas and petroleum resources are soon to be found would render CESIZ important in energy policies. Both the logistics base and the liquefaction process loom large in the transportation of natural gas extracted from the region to Europe.

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