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A Research on Transportation Opportunities Between Container Ports and Logistics Centers of Kocaeli

Kocaeli Kentinin Konteyner Limanları ve Lojistik Merkezleri Arasındaki Ulaştırma Olanakları Üzerine Bir Araştırma

Engin Kudu[1], Birsen Koldemir[2]

Öz

Dünya ticaretinde olduğu gibi Türkiye'de de konteyner taşımacılığı ve çeşitli yüklerin konteynerle taşınması eğilimi artmaktadır. Üstelik Kovid-19 pandemi süreci ile birlikte üretim merkezlerinin yer değiştirdiği dünyada Türkiye'nin üretiminin artacağı ve limanlarındaki konteyner trafiğinin beklentilerin üzerinde artacağı söylenebilir. Bu bağlamda Kocaeli şehrinin konteyner limanları ve lojistik merkezleri arasında daha fazla konteyner taşımacılığının gerçekleşeceği öngörülmektedir. Konteyner taşımalarındaki bu artışın kent, liman ve lojistik odakların trafiğini aksatmaması için gelişim süreçlerinin iyi planlanması gereklidir. Bu planlama mevcut durum, sektör paydaşlarının talepleri ve gelecek vizyonu bağdaştırılarak gerçekleştirilmelidir. Bu çalışma ile Kocaeli konteyner limanları, lojistik merkezleri ve kentin ekonomik ve sürdürülebilir kalkınması için alternatif ulaşım yöntemlerine ihtiyaç duyulup duyulmadığını ortaya koymak ve tüm lojistik paydaşlarının görüşlerini analiz ederek çözüm önerileri sunmak amaçlanmaktadır. Araştırmada toplanan veriler IBM SPSS 22.0 programında Kruskal Wallis H testi kullanılarak analiz edilmiş ve hipotezler sorgulanmıştır. Kocaeli kentindeki limanların ve lojistik paydaşların rekabetçi bir yapıda gelişmesi için ulaştırmada alternatif olanakların yeniden gözden geçirilmesi, limanlarla Köseköy Lojistik merkez arasındaki karayolu ve demiryolu ulaşım kapasitelerinin arttırılmasının uygun olacağı, yeni/alternatif bir ulaştırma yönteminin limanların/lojistik işletmelerin verimliliğini olumlu etkileyeceği, lojistik merkeze iç suyolu/kanal ulaşımı ile entegre olunmasının ilerleyen zamanlar için faydalı olabileceği, iş hacmi ve verimlilik üzerinde orta düzeyde etkili olabileceği görüşleri elde edilmiştir.

Anahtar Kelimeler: Alternatif ulaştırma, Kocaeli kenti, Limanlar, Lojistik merkezler, Ulaştırma olanakları

ABSTRACT

Similar to world trade, container transportation and the tendency to transport various cargoes with containers is increasing in Türkiye. Moreover, in a world where production centers will be shifting with the Covid-19 pandemic, it can be said that Türkiye's production will increase and over and above expectations, container traffic in its ports will expand. In this context, it is anticipated that the urban of Kocaeli will need more container transportation between container ports and logistics centers. Development processes need to be well planned so that this increase in container transportation does not disrupt the traffic of cities, ports and logistics centers. This planning should be carried out by reconciling the current situation, the demands of the logistic stakeholders and the future vision. This study aims to reveal whether Kocaeli container ports, logistics centers and the urban need alternative transportation methods for economic and sustainable development and to offer solution suggestions by analyzing the opinions of all logistics stakeholders. The data collected in the research were analyzed using the Kruskal Wallis H test in the IBM SPSS 22.0 program, and the hypotheses were questioned. Reconsidering alternative opportunities in transportation for the development of ports and logistics stakeholders of Kocaeli urban in a competitive structure, increasing the road and railway transportation capacities between the ports and Köseköy Logistics center will be appropriate, a new/alternative transportation method will have a positive impact on the efficiency of the ports/logistics businesses, inland waterway/canal to the logistics center. It has been concluded that integration with transportation may be beneficial in the future and may have a moderate impact on business volume and productivity.

[1] Engin Denizcilik İşletme, Eğitim, Danışmanlık, enginkudu@yahoo.com, ORCID: https://orcid.org/0000-0002-7117-8477

[2] Corresponding Author: İstanbul University-Cerrahpaşa, Faculty of Engineering, Maritime Transportation Management Engineering, bkr@ıuc.edu.tr, ORCID: https://orcid.org/0000-0002-1614-6624

Keywords: Alternative transportation, Kocaeli urban, Ports, Logistics centers, Transportation opportunities

INTRODUCTION:

It is known that maritime trade activities were under the control of foreign nationals, and the structural development of ports was carried out under the concession granted to the Anatolian Baghdad Railway Company until the early years of the Republic of Türkiye. Ports were transferred to the General Directorate of State Railways and Ports in 1927 through relevant laws, and in 1953 they were handed over to TCDD (Turkish State Railways) Operations and operated solely by the state. With the development of industry and the private sector, in the 1970s, private ports were established for factories to handle their own cargo needs. In the 1980s, with the approach towards privatization, private ports were also established to serve third parties (Atiyas, 2009). In the 2000s, foreign investors from around the world started making investments as operators in the port sector (Esmer and Duru, 2017). The number of foreign entrepreneurs investing in infrastructure and beyond in the port industry has been increasing up to the present day. Alongside ports with minor foreign ownership, there have been investments in the sector that particularly demonstrate confidence in container terminals, where foreign ownership exceeds 50%, such as MSC (Asyaport), Cosco Pacific (Kumport), SOCAR (Petlim), and DP World (DP World Yarımca). These investments illustrate the growing trust in the development of the sector.

Kocaeli Province is also affected by this process, with new container port investments and capacity increases at existing ones. After our literature research, it has been seen that there are some studies on the efficiency analysis of Turkish private ports (Çağlar, 2012) and the proposal of an optimization model for dry port application for container transportation from Kocaeli ports (Saka and Çetin, 2019 and 2019). In both studies, the details of the efficiency analyses of the ports and the importance of creating an optimized model between the dry port and container port were emphasized. In another study, the impact of ports on international trade and the role of Kocaeli ports in the Turkish economy (Bayraktutan and Özbilgin, 2013) were examined. It has been concluded that to develop the ports in the city and operate them more economically, priority should be given to investments that increase efficiency and capacity. Furthermore, there are Cargo Demand Forecast for Kocaeli Ports study (Doğusel, 2021), which found that the current capacity will be insufficient as of 2033 and it has been concluded that new container capacity will be needed in Kocaeli. Again, a study on port-city interaction (Kudu, 2008), has seen that there are examples in the world where ports and cities surround each other and harm their functioning.

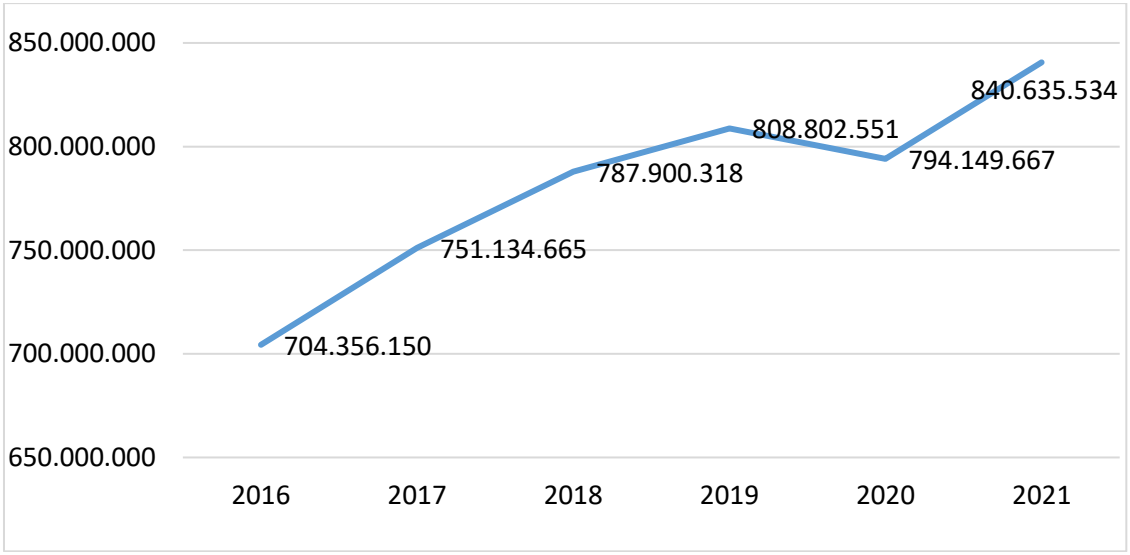
It is important for the healthy development of container ports, which grow with these investments, together with all logistics stakeholders and the urban. As seen in some examples around the world, they must be prevented from gradually surrounding each other and deteriorating their functioning. In this way, it is thought that investments in the sector can be sustainable at the same time. This issue is also important in terms of preventing waste of country resources. With this study, it is aimed to reveal the existing transportation opportunities whether they need alternative transportation methods and to offer solutions by analyzing the opinions of all logistics stakeholders for the economic and sustainable development of Kocaeli container ports, logistics centers and the urban. In this regard, transportation opportunities among the logistics stakeholders of Kocaeli City were revealed, studies in the literature were included and the opinions of all logistics stakeholders were taken and analyzed. With this study, the effects of the new/alternative transportation (inland waterway/canal) method to be established in the region have been examined for the first time. The participation of more than 70% of the applicable logistic stakeholders can be described as the success of this study. It is also important that logistics stakeholders emphasize that alternative transportation methods will increase business volumes and efficiency.

1. The Developments of Container Terminals Worldwide, in Türkiye and Kocaeli

Since the idea of transporting goods in steel boxes to prevent damage and facilitate faster handling emerged, containers and ports have continued to evolve. Initially, these steel boxes were used to

transport packaged and break-bulk cargo, but today, with the help of special designs, almost all types of cargo, including some liquids and bulk goods, can be transported using containers. To reduce empty container returns to the required ports and make this mode of transportation more economical, carriers and forwarders (brokers) put considerable effort into maximizing all commercial opportunities (Veenstra, 2005). As a result of these efforts, the global container traffic, as shown in Graphic 1, has shown an increasing trend over the years but experienced an approximate 15 million TEUs (twenty-foot equivalent units) decrease in the year 2020 when the COVID-19 pandemic began.

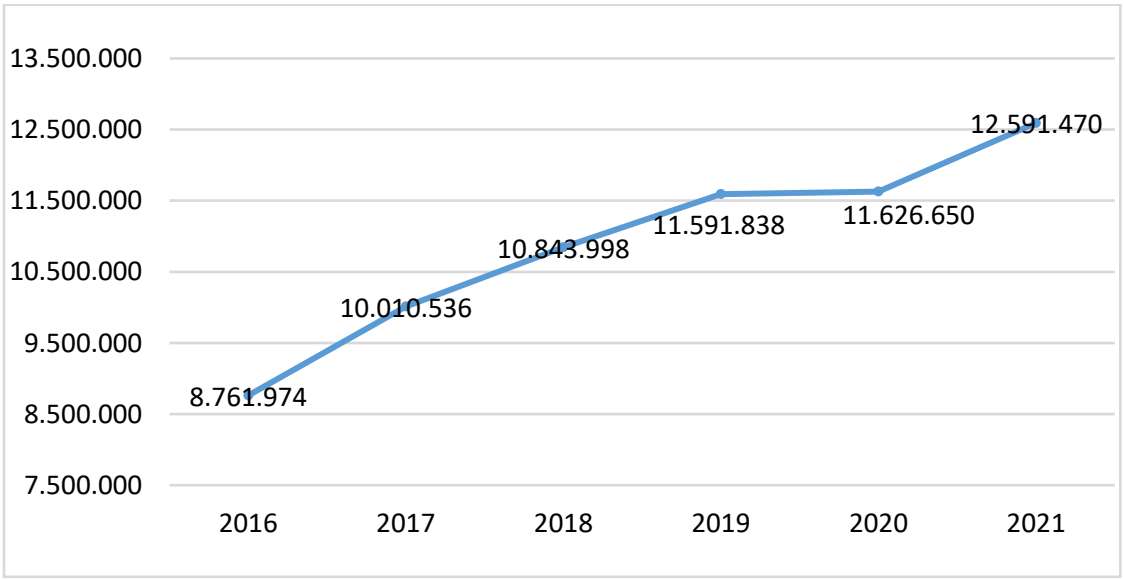
Graphic 1. World Container Port Traffic by Years (TEU)



Source: Compiled from World Bank data (https://data.worldbank.org/indicator/IS.SHP.GOOD.TU?end=2021 &start=2016&view=chart.

However, during the same period, as seen in Graphic 2, container transportation has continued to show a slight increase, especially in countries like Türkiye, where production has been ongoing.

Graphic 2. Türkiye Container Port Traffic by Years (TEU)



Source: Compiled from UAB, General Directorate of Maritime data (https://denizcilikistatistikleri.uab.gov.tr/konteyner-istatistikleri)

The continuity of the growth in container transportation has led to increased work intensity at ports and related logistics centers and has also resulted in higher traffic density in the transportation modes within their vicinity (Lonza and Marolda, 2016).

Traffic is a common issue in all major cities, and when vehicles entering and exiting ports get involved in urban traffic, the situation can become damaging for both the port and the urban (Cao and Shahraki, 2023). People's reactions to port traffic will increase, and with the impact of urban traffic, delayed cargo arrivals at the port can lead to significant financial losses.

If the congestion is not overcome and necessary measures are not taken, ports will gradually lose their functionality. As mentioned in Rosselli's study (2005), which refers to five distinct recurring stages in the physical evolution of the city-port interface, this process can result in moving the port to a more distant location and renewing the old port for urban functions (Stage 4) (Kudu, 2008).

2. Materials and Methods

2.1. The Modes and Rates Used by Kocaeli Container Ports in Transportation with Logistic Centers

Transportation between Kocaeli ports and logistics centers is predominantly carried out by road. The availability of railway connections that could serve as an alternative for cargo traffic to the ports is quite limited, and coastal shipping is also insufficient.

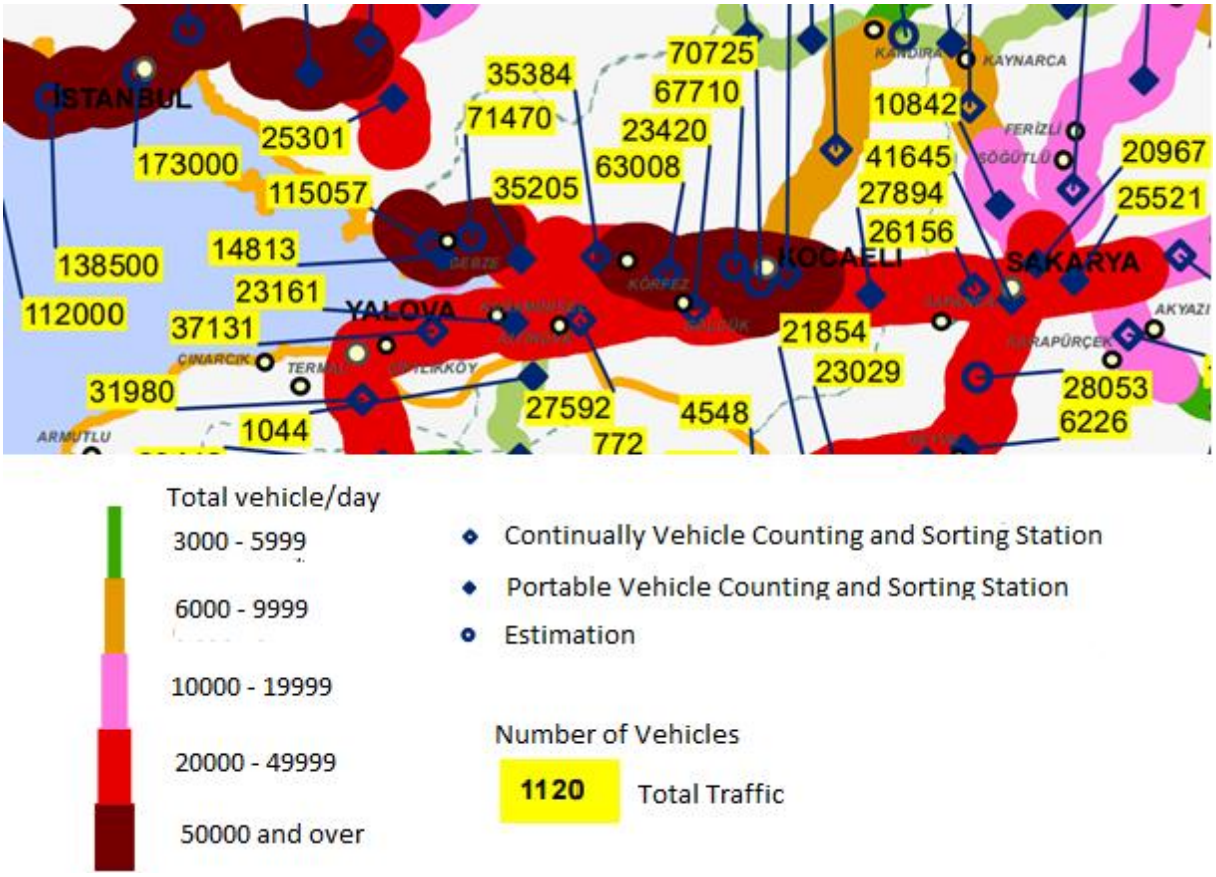


Figure 1. State Highways Traffic Volume Map 2022, Annual Average Daily Traffic Value (Developed by the author using Karayolları Genel Müdürlüğü Traffic Volume Maps)

As seen in Figures 1 and 2, vehicle traffic on the state highways and highways in Kocaeli province is one of the most congested regions in the country. Although the opening of the Northern Anatolian Highway partially diverted transit heavy vehicle traffic away from the region, the increasing transportation demands in the industrial and logistics hub of Kocaeli will not permanently prevent congestion on the roads.

Some sectoral targets set during the 10th Transport Council in 2009 and the 12th Transport Council in 2021 by the Ministry of Transport and Infrastructure are as follows.

- Increasing the share of sea transportation in domestic transport to 15% (ton/km) and the containerization rate to 15% (TEU) (in 2009).
- Integrating port and maritime facilities into the national transportation and trans-European networks (in 2009).
- Increasing the total length of connecting lines to logistics centers, factories, industrial zones, and ports to 580 km to facilitate connections (in 2021).
- Raising the share of railway freight transportation within land transport to 11% (in 2021).
- Developing short-distance sea transportation in Türkiye and supporting and encouraging Ro-Ro (Roll-on/roll-off) transportation based on criteria such as distance, new routes, and service speed to utilize the country's strategic advantages (in 2021).
- Increasing the length of divided roads (including highways) to 38,060 km and the length of tunnels to 1,050 km (in 2021).

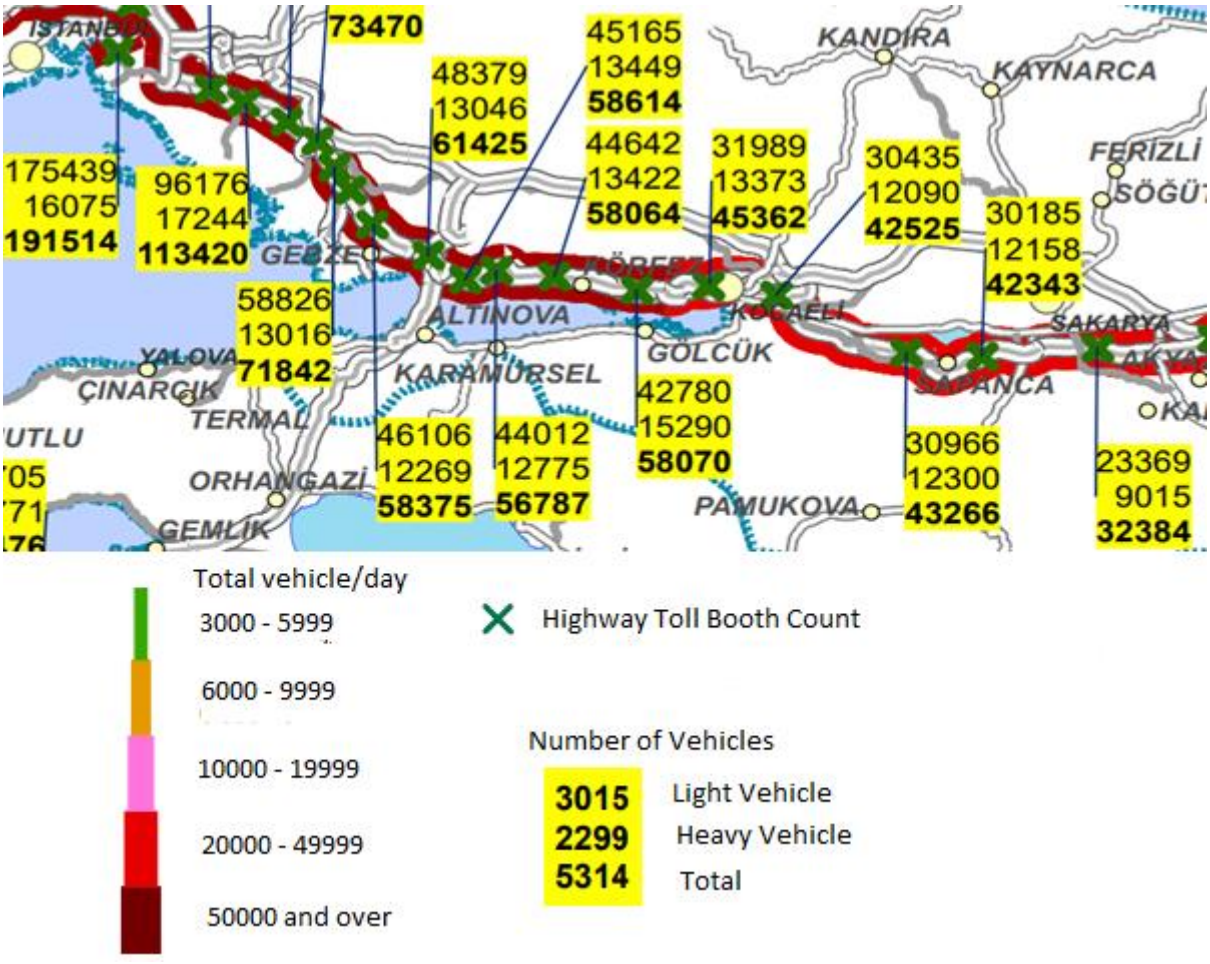


Figure 2. Highway Traffic Volume Map (2022), Annual Average Daily Traffic Value (Developed by the author using Karayolları Genel Müdürlüğü Traffic Volume Maps)

Within our working region, Körfez Ulaştırma A.Ş. started its freight transportation activities in 2017 after obtaining the necessary permits and became Türkiye's first private railway train operator (www.uab.gov.tr). Seven facilities in the region have railway connections and can use railways to some extent for cargo handling, namely Safi Derince, Tüpraş, Karayolları İkmal Müdürlüğü, Gübretaş,

Yılport-Yarımca, Evyapport, and DP World Yarımca Port (Kudu, 2021). Considering that there are approximately 36 port facilities in the region, almost all of which are adjacent to railways, this number is considered insufficient. Unfortunately, there is a lack of reliable statistics on rail transfers between ports and railways in our study area. However, a research study in 2021 (Kudu, 2021) found that businesses have an average usage rate of 94.13% for road transportation, 3.56% for railway transportation, and 2.24% for coastal shipping when it comes to transportation to ports/logistics centers.

Considering these data, there seems to be an imbalance in the distribution of transportation modes between Kocaeli ports and logistics centers. Stakeholder opinions on whether diversifying transportation modes would be beneficial for the region's strategic, economic, and urban development in the long term can shed light on future studies.

It was found that 35.1% of stakeholders considered the transportation capacity between container ports and Köseköy Logistics Center to be sufficient, while 45.9% deemed it inadequate (Kudu, 2021).

To understand the perspectives and needs of the logistics centers and container ports in the region regarding alternative transportation modes, high-level managers were interviewed and researched (Kudu, 2021). The collected data were analyzed, hypotheses were formed. The hypotheses are as follows:

$H1_0$: "There is no significant difference in the views of managers on the sufficiency of the transportation capacity between ports and Köseköy Logistics Center based on the type of business".

$H2_0$: "There is no significant difference in the views of managers on the impact of a new/alternative transportation method other than the existing ones on the efficiency of the port/logistics operation based on the type of business".

$H3_0$: "There is no significant difference in the views of managers on whether their businesses should be integrated with inland waterway/canal transportation to Köseköy Logistics Center based on the type of business".

$H4_0$: "There is no significant difference in the views of managers on the effect of their businesses being integrated with inland waterway/canal transportation on business volume based on the type of business".

$H5_0$: "There is no significant difference in the views of managers on the impact of their businesses being integrated with inland waterway/canal transportation on efficiency based on the type of business".

2.2. Methodology

The research universe is the operating Container ports, line-owning agencies-firms carrying out national and international container transportation activities in these ports, companies providing storage-stuffing-stuffing-lashing services, logistics centers mainly on containers, it consists of companies that carry out transportation (more than 500 transportations per year) and other stakeholder companies that provide services on containers in the Gulf of İzmit / Kocaeli. Although 145 companies were identified according to the Nace code, 26 of them were qualified to apply the interview form, bringing the research population to 52 companies, together with other companies (Table 1). The research was conducted using semi-structured interview forms (questionnaires) containing Likert-type scale questions and open-ended questions used in this study. The questionnaire forms were developed with the assistance of academics who had conducted similar studies and opinions from top-level managers in the industry. The questionnaire forms were shared with the port and logistics center stakeholders in the study area, and the data were collected by filling in face-to-face interviews with a person from among the top managers of the enterprises and

some of them by phone contact from September 1, 2020, to March 19, 2021. Fifty-two (52) companies were identified for which the total interview form was applicable, while the interview form was filled by the managers of thirty-seven (37) companies, twelve (12) companies and their managers stated that they did not want to participate in the study due to various reservations and reasons, despite our clarifications and repeated requests.

Based on their primary activities, the companies that completed the interview forms were grouped as port operators, warehouse operators providing container freight services (CFS), companies mainly engaged in transportation services, container shipping companies, and other companies offering container-related services.

The data collected in the research were analyzed using the IBM SPSS 22.0 program, and frequency analysis and Kruskal-Wallis (KW) H test were employed. In each hypothesis, the other variable is the opinions of business managers on various topics. Each variable represents the opinions on a different subject in each hypothesis. However, all of these variables are measured using a 5-point Likert Scale. In other words, the highest value each variable can take is 5, and the lowest value is 1. The highest value indicates very positive opinions on the subject, while the lowest value indicates no positive opinion. In testing the hypotheses, these variables were treated as continuous variables. The difference between the maximum and minimum values of these variables is 5-1=4, and the value range is 4/5=0.8. Based on this, the values of the variables are evaluated as follows: 1.00-1.79: "very low", 1.80-2.60: "low", 2.61-3.41: "moderate", 3.42-4.22: "high", 4.23-5.00: "very high".

Considering both the explanations made for the variables involved in the hypotheses and the small sample size, the differences in the opinions of business managers on various topics based on the type of business were tested using the Kruskal-Wallis test. In this test method, when the p (sig.) value is greater than 0.05, it is concluded that there is a significant relationship between the variables (Cevahir, 2020).

3. Findings and Discussion

According to the reliability analysis conducted on the questionnaire's questions and responses, Cronbach's Alpha coefficient was found to be 0.759, indicating that the measurement in the study is consistent (Kudu, 2021).Statistics about the enterprises for which the interview form was applied are given in Table 1.

Table 1. Statistics of the companies where the interview form was applied

Company types and numbers	Total Company	Interview form applicable comp.	Interview form-filled companies	Applicability percentage (%)
1. Container port companies	6	6	6	100
2. Container line companies (detected)	13	13	6	46,1
3. Companies by relevant nace code	145	26	18	69,2
4. Companies identified during fieldwork	7	7	7	100
Total	172	52	37	71,1

Source: Created by the researcher from the data obtained during the fieldwork.

Table 2 presents the descriptive statistics and distributions of the businesses included in the research according to their types: 16.2% port operator (n=6), 18.9% warehouse operator providing CFS services (n=7), 43.2% company primarily engaged in transportation services (n=16), 16.2% container shipping company (n=6), and 5.4% others (n=2).

Table 2. Company descriptive statistics

Variables	Category	Frequency (n)	Percentage (%)
Company Type	Port operator	6	16.2
	Warehouse operator providing CFS services	7	18.9
	The company mainly engaged in transportation services	16	43.2
	Container shipping company	6	16.2
	Others	2	5.4
	Total	**37**	**100.0**
Activity Duration	0-10 Years	15	46.9
	11-20 Years	12	37.5
	21 Years and above	5	15.6
	Total	**32**	**100.0**
Number of employees	0-50 employee	15	41.7
	51-100 employee	7	18.9
	101 employees and above	15	41.7
	Total	**36**	**100.0**

The frequency distributions of the responses to the open-ended question "Road capacity should be increased" are as follows (Table 3): 40.5% No response (n=15), 2.7% Insufficient connection roads (n=1), 2.7% Connections should be strengthened (n=1), 2.7% Definitely sufficient for today (n=1), 48.6% Capacity should be increased (n=18), 2.7% Traffic problem should be solved (n=1). The high percentage of companies expressing their opinion in favor of increasing road capacity (48.6%) is believed to be due to the larger number of "companies primarily engaged in road transportation services" participating in the questionnaire.

Table 3. Opinions on increasing road transportation capacities

Expression	Frequency (n)	Percentage (%)
No response	15	40.5
Insufficient connection roads	1	2.7
Connections should be strengthened	1	2.7
Definitely sufficient for today	1	2.7
Capacity should be increased	18	48.6
The traffic problem should be solved	1	2.7
Total	37	100.0%

The frequency distributions of the responses to the open-ended question "Railway capacity should be increased" are as follows (Table 4): 48.6% No response (n=18), 2.7% Not available in our region (n=1), 2.7% Number of railway lines should be increased (n=1), 40.5% Capacity should be increased (n=15), 2.7% Usage rate should be increased (n=1), 2.7% Should be incentivized (n=1). The high percentage of companies (15 companies) expressing their opinion in favor of increasing railway capacity is considered to indicate that the current transportation infrastructure is not sufficient.

Table 4. Opinions on increasing railway capacities

Expression	Frequency (n)	Percentage (%)
No response	18	48.6
Not available in our region	1	2.7
The number of railway lines should be increased	1	2.7
Capacity should be increased	15	40.5
Usage rate should be increased	1	2.7
Should be incentivized	1	2.7
Total	37	100.0

Regarding the alternative creation of inland waterways/canals, the participant views are presented in Table 5 along with the relevant statistics.

Table 5. Views and statistics on creating alternatives with inland waterways/canals

Expression	Frequency (n)	Percentage (%)
No response	22	62.2
It can be an alternative	10	27.0
We don't see the possibility	1	2.7
Capacity should be increased	1	2.7
It can be formed in the long term	1	2.7
Investment is necessary	1	2.7
Total	37	100.0

The frequency distributions of the responses to the open-ended question "An alternative can be created with inland waterways/canals" are as follows: 62.2% No response (n=22), 27% It can be an alternative (n=10), 2.7% We don't see the possibility (n=1), 2.7% Capacity should be increased (n=1), 2.7% It can be formed in the long term (n=1), 2.7% Investment is necessary (n=1). The main reason for the high percentage of no responses might be that most of the participants are companies primarily engaged in road transportation, and they may have concerns about potential loss of business and lack of vision/experience in inland waterway transportation. However, it is valuable to note that out of the fourteen companies who responded, ten, which is 71.4%, believe that inland waterway transportation can be an alternative, which could be considered for future projections.

Regarding the effects of new/alternative transportation methods other than the existing ones on the efficiency of ports/logistics operators, the statistics of the opinions of company authorities are presented in Table 6.

Table 6. Statistics on the effects of new/alternative transportation methods on the efficiency of ports/logistics operators

Question	Answer	Frequency (n)	Percentage (%)	$\bar{X}$	S. S.
Does a new/alternative transportation method other than the existing ones affect the efficiency of your port/logistics operator?	definitely does not affect (1)	1	2.7	3.89	1.17
	does not affect (2)	5	13.5		
	undecided	6	16.2		
	affects (4)	10	27.0		
	definitely affects (5)	15	40.5		
	Total	**37**	**100.0**		

$\bar{X}$: Average, S. S.: Standard deviation

The frequency distributions of the responses to the question "Does a new/alternative transportation method other than the existing ones affect the efficiency of your port/logistics operator?" are as follows: 2.7% Definitely does not affect (n=1), 13.5% Does not affect (n=5), 16.2% Undecided (n=6), 27% Affects (n=10), 40.5% Definitely affects (n=15). When the mean score (3.89±1.17) is examined, it is observed that the sample mean is close to the "Affects" response.

The statistics regarding the thoughts on integrating with inland waterway/canal transportation to the logistics center are presented in Table 7.

Table 7. Statistics on thoughts regarding the integration with inland waterway/canal transportation to the logistics center

Question	Answer	Frequency (n)	Percentage (%)	$\bar{X}$	S. S.
How do you evaluate the integration with inland waterway/canal transportation to the logistics center?	definitely negative (1)	2	5.4	3.48	1.01
	negative (2)	2	5.4		
	undecided (3)	13	35.1		
	positive	13	35.1		
	definitely positive (5)	5	13.6		
	no answer	2	5.4		
	Total	**37**	**100.0**		

Out of the 37 firms participating in the study, 35 responded to the question "How do you evaluate the integration with inland waterway/canal transportation to the logistics center?" When Table 25 is examined, it can be seen that 10.8% of the firms (n=4) have a negative view of the idea, while 48.7% (n=18) have a positive view of the idea. The frequency distributions of the responses to the question "How do you evaluate the integration with inland waterway/canal transportation to the logistics center?" are as follows: 5.4% Definitely positive (n=5), 13.6% Positive (n=13), 35.1% Undecided (n=13), 5.4% Negative (n=2), 5.4% Definitely negative (n=2). When the mean score (3.48±1.01) is examined, it is observed that the sample mean is close to the "Undecided" response (Table 7).

The statistics regarding the possible impact of the integration with inland waterway/canal transportation to the logistics center on the business volume are presented in Table 8.

Table 8. Statistics on the potential impact of integration with inland waterway/canal transportation to the logistics center on business volume

Question	Answer	Frequency (n)	Percentage (%)	$\bar{X}$	S. S.
How does the integration with inland waterway/canal transportation to the logistics center affect your business volume?	definitely does not increase (1)	1	2.7	3.42	1.05
	does not increase (2)	6	16.2		
	undecided (3)	12	32.4		
	increases (4)	11	29.7		
	definitely increases (5)	6	16.2		
	No answer	1	2.7		
	Total	**37**	**100.0**		

The frequency distributions of the responses to the question "How does the integration with inland waterway/canal transportation to the logistics center affect your business volume?" are as follows: 16.2% Definitely increases (n=6), 29.7% Increases (n=11), 32.4% Undecided (n=12), 16.2% Does not increase (n=6), 2.7% Definitely does not increase (n=1). When the mean score (3.42±1.05) is examined, it is observed that the sample mean is close to the "Undecided" response. When examined without distinguishing by types, out of the 36 firms that answered the relevant question, 19.5% (n=7) of the firms believe that it will not increase their business volume, while 47.3% (n=17) believe that it will increase (Table 8).

Opinions on the possible impact of integrating the logistics center with inland waterway/canal transportation on productivity are as in Table 9.

Table 9. Statistics on the potential impact of integration with inland waterway/canal transportation on efficiency in the logistics center

Question	Answer	Frequency (n)	Percentage (%)	$\bar{X}$	S. S.
How would integration with inland waterway/canal transportation affect your efficiency?	definitely does not increase (1)	2	5.4	3.39	0.96
	does not increase (2)	3	8.1		
	undecided (3)	13	35.1		
	increase (4)	15	40.5		
	definitely increases (5)	3	8.1		
	No answer	1	2.7		
	Total	**37**	**100.0**		

The frequency distributions of the responses to the statement "How would integration with inland waterway/canal transportation affect your efficiency?" are as follows: %8.1 definitely increases (n=3), %40.5 increases (n=15), %35.1 undecided (n=13), %8.1 does not increase (n=3), %5.4 definitely does not increase (n=2). When the mean value (3.39±0.96) is examined, it is observed that the sample average is close to the "undecided" response. When all 36 companies, regardless of their types, are examined about the relevant question, it is observed that %13.9 (n=5) of the companies believe that integration will not increase efficiency, while %50 (n=18) of them believe it will increase efficiency.

3.1. Data Collection Tools

As mentioned in the previous section, interviews were conducted with businesses operating in five different categories. These categories include port operators, CFS service-providing depots and lashing companies, transportation service providers, line owners, and finally, agency/brokerage firms. Therefore, the type of business is a categorical variable with five distinct categories. However, due to only reaching two firms in the agency/brokerage category, this category was excluded from the analysis as it was deemed insufficient for analysis purposes.

3.2. Data Analysis

The findings of the Kruskal Wallis H test conducted to test the hypotheses are presented in Table 10.

The distribution of the views of business managers on various subjects (each subject in each hypothesis) according to the types of businesses and the results of the tests conducted to determine whether these views differ according to the type of business are provided in Table 10.

Table 10. Kruskal Wallis H Test results for differences in managerial views by company type

Variables	Company type	N	$\bar{X}$	S. D.	$\bar{r}$	$X^2(3)$	sig.
K1: Adequacy of transportation capacities to the logistics center by road and rail	Type 1	6	2.667	1.211	18.33	0.802	0.849
	Type 2	7	2.286	1.380	15.07		
	Type 3.	16	2.750	1.065	19.03		
	Type 4	6	2.667	1.211	18.33		
K2: The effects of a new/alternative transportation method on the efficiency of the port/logistic company	Type 1	6	3.833	0.753	16.75	4.774	0.189
	Type 2	7	4.429	1.134	23.79		
	Type 3.	16	3.438	1.263	14.81		
	Type 4	6	4.167	1.169	21.00		
K3: Opinions on integrating the logistics center with inland waterway/canal transportation	Type 1	6	3.833	0.753	21.00	2.658	0.447
	Type 2	7	3.000	1.000	13.36		
	Type 3.	14	3.286	0.914	16.29		
	Type 4	6	3.667	1.211	18.92		
K4: The effects of integrating the logistics center with inland waterway/canal transportation on the business volume	Type 1	6	3.667	1.211	19.75	2.206	0.531
	Type 2	7	3.143	1.345	15.93		
	Type 3.	15	3.200	0.941	15.67		
	Type 4	6	4.833	0.753	21.67		
K5: The effects of integrating the logistics center with inland waterway/canal transportation on efficiency	Type 1	6	3.667	0.816	20.08	3.131	0.372
	Type 2	7	3.000	1.115	15.14		
	Type 3.	15	3.133	0.915	15.63		
	Type 4	6	3.833	0.753	22.33		

Type 1: Port operator, Type 2: Warehouse/lashing operator providing CFS services, Type 3: Company mainly engaged in transportation services, Type 4: Container shipping company, N: Number of samples, $\bar{X}$: Average, S.D.: Standard deviation, $\bar{r}$: coefficient of influence, $X^2(3)$: ki-square (degrees of freedom), sig.: p-value of the test.

When examining the views of the companies on the "adequacy of road and railway transportation capacities to the Köseköy Logistics Center" (K1), it is observed that the level of positivity is low among the CFS service providers and moderate among other companies. The rates of perceiving transportation capacities as adequate did not exceed the statistically significant level among all companies. There was no statistically significant difference found among port operators (2.667±1.211), CFS service providers (2.286±1380), companies providing predominantly transportation services (2.750±1.065), and companies owning freight cars (2.667±1.211) ($X^2(3)$ = 0.802, Sig.>0.05), confirming Hypothesis $H1_0$.

Regarding the views on the adequacy of road and railway connections between the ports and the Köseköy Logistics Center (H1), it was found that the views of all companies did not exceed the moderate level, whereas CFS service providers expressed a lower level of adequacy. The KW analysis also indicates a general tendency towards strengthening existing road connections or creating alternative ones, as there was no significant difference in views based on company type.

When examining the views on the potential impacts of adopting a new/alternative transportation method beyond the existing ones on the port/logistics company's efficiency (K2), it was observed that CFS service providers had a very high level of positivity, while other companies had a high level of positivity. In general, all companies showed positive views, which were gathered at statistically high and very high levels. There was no statistically significant difference found among port operators (3.833±0.753), CFS service providers (4.429±1.134), companies providing predominantly

transportation services (3.438±1.263), and companies owning freight cars (4.167±1.169) ($X^2(3)$ = 4.774, Sig.>0.05), confirming Hypothesis $H2_0$.

Concerning the integration with inland waterway/canal transportation to the logistics center (K3), port operators and companies owning freight cars showed a high level of positivity, while companies providing predominantly transportation services and CFS service providers expressed a moderate level of positivity. In general, all companies' positive views did not fall below the moderate level. There was no statistically significant difference found among port operators (3.833±0.753), CFS service providers (3.000±1.000), companies providing predominantly transportation services (3.286±0.914), and companies owning freight cars (3.667±1.211) ($X^2(3)$ = 2.658, Sig.>0.05), confirming Hypothesis $H3_0$.

Regarding the potential impact of integrating with inland waterway/canal transportation on the company's business volume (K4), port operators and companies owning freight cars expressed a high level of positivity, while companies providing predominantly transportation services and CFS service providers had a moderate level of positivity. In general, all companies' positive views did not fall below the moderate level. There was no statistically significant difference found among port operators (3.667±1.211), CFS service providers (3.143±1.345), companies providing predominantly transportation services (3.200±0.941), and companies owning freight cars (3.833±0.753) ($X^2(3)$ = 2.206, Sig.>0.05), confirming Hypothesis $H4_0$.

Concerning the potential impact of integrating with inland waterway/canal transportation on the company's efficiency (K5), port operators and companies owning freight cars expressed a high level of positivity, while companies providing predominantly transportation services and CFS service providers had a moderate level of positivity. In general, all companies' positive views did not fall below the moderate level. There was no statistically significant difference found among port operators (3.667±0.816), CFS service providers (3.000±1.155), companies providing predominantly transportation services (3.133±0.915), and companies owning freight cars (3.833±0.753) ($X^2(3)$ = 3.131, Sig.>0.05), confirming Hypothesis $H5_0$**.**

The positive level of opinions on the effect of integrating the logistics center with inland waterway/canal transportation, which is the subject of the H5 hypothesis, on productivity was collected at high and medium levels, and in the KW analysis, it was determined that there was no significant difference between the opinions according to the type of business. The emergence of data very close to the results of the previous two hypotheses with a similar structure is thought to indicate that the subject is well understood.

In this context, it can be said that studies on the alternative transportation mode to be implemented are necessary for the sector, it is adopted and the probability of being beneficial is very high.

CONCLUSION:

Nearly 40 years have passed since Türkiye abandoned the statist approach in the development process of port infrastructure and paved the way for private sector investments. During this period, in the city of Kocaeli, some services were tried to be carried out with finger piers, which were established to feed the factories behind it and which Prof. Dr. N. Akten likened to slum-style development. In recent years, with the investments made by international port operators in Kocaeli, the number of ports that have reached international standards, especially in terms of container ports, has increased rapidly. However, the sustainability of this development and change requires changes in infrastructure and services, along with many arguments. In particular, the inadequacy of the rear area in ports or the centralization of all logistics services requires more efficient operation of traffic between ports and logistics centers.

In an environment where container transportation is increasing in Kocaeli and the urban is becoming increasingly crowded, alternative formations will be needed in transportation systems to ensure healthy interaction between the port, the logistics center and the urban.

According to obtained from the research data and analysis;

-It is understood that none of the participants think that railway connections are sufficient and only 2.7% think that road connections are sufficient. The majority of logistic sector stakeholders who expressed their opinions think that the existing transportation capacities between ports and logistics centers should be increased.

-67.5% of the participants think that new/alternative methods will affect their businesses. The majority of sector stakeholders think that a new/alternative transportation method other than the existing ones will positively affect the efficiency of the port/logistics enterprises.

-The rate of logistic stakeholders who are positive about the integration of the logistics center with inland waterway/canal transportation is four times higher than those who are negative.

-The number of logistic stakeholders who think that integrating into the logistics center with inland waterway/canal transportation will increase the efficiency of businesses is twice as high as those who think it will not.

-The number of logistic stakeholders (n=17, %45,9) who think that the above integration will increase the business volume of enterprises is approximately three times higher than those who (n=7, %18,9) do not think this.

-The number of logistics stakeholders who think that the above integration will increase the efficiency of businesses (n=18, 48.6%) is almost four times higher than those who do not think so (n=5, 13.5%).

The results reveal that it is necessary to work on alternative transportation types in line with the demands of the sector stakeholders, that they are adopted and are likely to benefit the sector, and that it would be appropriate to increase the road and railway transportation capacities between ports and logistics centers. It is thought that with the establishment of the Köseköy Logistics Center, a new/alternative transportation method will positively affect the business volume and efficiency of port/logistics enterprises. It would be useful to conduct more detailed studies on these issues.

Compliance with the Ethical Standard

Conflict of Interests: *The author(s) declare that they do not have a conflict of interest with themselves and/or other third parties and institutions, or if so, how this conflict of interest arose and will be resolved, and author contribution declaration forms are added to the article process files with wet signatures.*

Ethics Committee Permission: *In this article, ethics committee approval is not required, and a consent form affirming that a wet-signed ethics committee decision is not necessary has been added to the article process files on the system.*

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