

ANALYZING OF GLOBAL LOGISTICS PERFORMANCE INDEX (LPI) IN TERMS OF LOGISTICS AND SUPPLY CHAIN ACTIVITIES IN TURKEY

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ABSTRACT

The logistics sector has become an extremely important sector for all countries and economies of the world in recent years. Increasing competitive conditions do not only affect international businesses in terms of logistics, but also seriously affect the countries of the world. Especially well-organized logistics and supply chain activities positively affect concepts such as production, export, import, marketing, and distribution. The logistics sector creates significant economic impacts on the country's economy with the employment it creates national income and directing foreign capital. Therefore, the logistics sector is extremely important for the growth of country economies. As a result, these situations have made logistics an important sector and the logistics sector has reached the position of having the largest share among service sectors in many countries. Due to the importance of logistics for the development of country economies and its comprehensive structure for almost every sector, the research carried out analyzes on the scores of some countries in the Logistics Performance Index (LPI). Here, Turkey's situation in terms of logistics and supply chain is also analyzed. By focusing on the evaluations made because of the analysis, some inferences were obtained in terms of Turkey's logistics and supply chain infrastructure. Lastly, in terms of LPI score, it has been determined that Turkey is behind the scores of G7 countries. In addition, Turkey's LPI score is at an average level compared to BRICS and G20 countries.

Keywords: Logistics, Supply Chain, Logistics Performance Index (LPI).

KÜRESEL LOJİSTİK PERFORMANS ENDEKSİNİN (LPI) TÜRKİYE'DEKİ LOJİSTİK VE TEDARİK ZİNCİRİ FAALİYETLERİ AÇISINDAN ANALİZİ

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ÖZET

Lojistik sektörü son yıllarda tüm dünya ülkeleri ve ekonomileri için son derece önemli bir sektör haline gelmiştir. Artan rekabet koşulları, uluslararası işletmeleri sadece lojistik açıdan etkilememekte, aynı zamanda dünya ülkelerini de ciddi anlamda etkilemektedir. Özellikle iyi organize edilmiş lojistik ve tedarik zinciri faaliyetleri üretim, ihracat, ithalat, pazarlama ve dağıtım gibi kavramları olumlu yönde etkilemektedir. Lojistik sektörü, oluşturduğu istihdam, milli gelir ve yabancı sermayeye yön vermesiyle ülke ekonomisine önemli ekonomik etkiler oluşturmaktadır. Bu nedenle lojistik sektörü ülke ekonomilerinin büyümesi açısından son derece önemlidir. Sonuç olarak bu durumlar lojistiği önemli bir sektör haline getirmiş ve lojistik sektörü birçok ülkede hizmet sektörleri arasında en büyük paya sahip konuma gelmiştir. Lojistiğin ülke ekonomilerinin kalkınması açısından taşıdığı önem ve hemen hemen her sektörü kapsayan geniş yapısı nedeniyle arařtırmada bazı ülkelerin Lojistik Performans Endeksi'ndeki (LPI) skorları üzerinde analizler yapılmıştır. Burada Türkiye'nin lojistik ve tedarik zinciri açısından durumu da analiz edilmiştir. Analiz sonucunda yapılan değerlendirmelere odaklanılarak Türkiye'nin lojistik ve tedarik zinciri altyapısı açısından bazı çıkarımlar elde edilmiştir. Son olarak LPI puanı açısından ise Türkiye'nin G7 ülkelerinin puanlarının gerisinde kaldığı belirlenmiştir. Ayrıca Türkiye'nin LPI puanı BRICS ve G20 ülkeleriyle karşılaştırıldığında ortalama düzeydedir.

Anahtar Kelimeler: Lojistik, Tedarik zinciri, Lojistik Performans Endeksi (LPI).

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1. INTRODUCTION

The logistics sector has become a dynamic sector that has been growing rapidly all over the world, especially in recent years. It is impossible not to mention the importance of logistics activities in terms of concepts such as supply chain, production, export, import, marketing, and distribution. Logistics is carried out by carrying out logistics activities, starting with the supply of raw materials for companies to produce, continuing with the inclusion of these raw materials in the production process, and then delivering the produced products to the final consumers. Therefore, the logistics sector is extremely important for the growth of country economies. The stronger and more effective the relationship between the logistics sector and the industrial sector, the greater the share of logistics in economic development.

Logistics is a very comprehensive concept that must be considered. In fact, one of the main reasons why the logistics sector is considered important is that it provides holistic service to all sectors. The concept of logistics does not only include transportation and transportation concepts. Logistics basically covers all kinds of processes that need to be considered within the supply chain, from the procurement of raw materials to the final point where the product is consumed. These processes mean ensuring the flow of information and processes, carrying out storage and inventory activities, and planning and controlling the process in a way that is both efficient and at minimum cost.

As a result, there are many types of services within the scope of logistics. These service types are transportation, packaging, wrapping, labeling, storage, handling, customs clearance, stock and inventory management, and customer relationship management. These services have made logistics an important sector, and logistics has become the sector with the largest share among service sectors in many countries.

The concept of logistics is a phenomenon that was first used in the military field. Later, this concept began to be used in economic and commercial areas all over the world, and over time, it emerged as a concept that covers the production of goods and services. In this context, we can define logistics as delivering the right product to the final consumption point at the right place and at the right time.

In order to satisfy consumer needs under the influence of rapid economic and technological developments in the world and increasing competition, the logistics process must be considered as a whole and well planned and managed in order to deliver final goods and services to the final consumption point effectively and at minimum cost.

According to the definition of the Council of Supply Chain Management Professionals (CSCMP), logistics is the movement of all kinds of products, services, and information flows within the supply chain, from the starting point of the raw material to the final point where the product is consumed, in order to meet the needs of customers. It is the process of ensuring, controlling, and planning the flow and storage of the inventory in the process in an effective, efficient, and least costly way.

The definition of logistics in the production sector is; It is the process that plans, implements and controls all steps in the process, including the flow, storage and processing of raw materials at an effective cost to meet the needs of customers, obtaining completed products, and from the source of the relevant information to the point of sale and delivery to the customer's home, and even the return of the products (Bozarth and Handfield, 2008).

According to Donald Bowersox and David Closs (1996), known as world-famous logistics and supply chain authorities, the main purpose of logistics is to achieve the targeted customer service level at the least cost. Logistics in achieving this basic goal; It requires the coordination of many activities that control and surround transportation, such as network design, information flow, stock, and warehouse management. In this context, a logistics system has six operational objectives: fast response, consistency, minimum stock, consolidation of shipments, life cycle support and quality.

The supply chain concept consists of suppliers, production centers, distribution centers and retailer stores, as well as raw materials, in-process inventories and final products transported within the system. This chain begins with the extraction of raw materials from the earth and ends when the product is reused or discarded (Ross, 1998).

Due to the importance of logistics and supply chain activities mentioned above for country economies and their comprehensive necessity for almost every sector, the research included the Logistics Performance Index published by the World Bank, which is widely known in the literature that examines the logistics potential and infrastructures of countries through a detailed study process. Analyzes were made based on the general scores of the countries. Here, Logistics Performance Index scores of Turkey were compared with developed and developing countries by year and some inferences were made in this context.

Finally, in the conclusion part of the study, the findings obtained as a result of the analyzes were evaluated, interpreted and suggestions were made.

2. LITERATURE REVIEW

The Logistics Performance Index was first published by the World Bank in 2007. It was later published in 2010, 2012, 2014, 2016, 2018, 2023, a total of 7 times. Since the Logistics Performance Index was first published, many studies have been carried out in this field from certain aspects. Many studies have been conducted regarding Turkey in this field.

Marti et al. (2014) analyzed the impact of each of the components that make up the logistics performance index on the trade of developing countries using the center of gravity model. In this study, the first logistics performance index data published in 2007 was compared with the data published in 2012. In addition, possible developments in logistics of the countries divided into 5 regions: Africa, South America, Far East, Middle East and Eastern Europe were tried to be determined.

GDP, population, distance between countries, logistics performance index and some other data sets were used for the center of gravity model. As a result of the study, it was seen that the improvement in any component of the logistics performance index led to an increase in the country's trade volume, and the components became increasingly important for countries in Africa, South America and Eastern Europe.

Ojala and Çelebi (2015) made a qualitative assessment of the trade and transportation policy environment by conducting a case study of Turkey. In line with the Logistics Performance Index data, Turkey's current position in logistics has been determined. LPI criteria were emphasized and these criteria were compared with the situation of the determined peer countries. The relevant study emphasizes the importance of developing policies to improve logistics performance and by implementing effective policies, countries can significantly increase their competitiveness in international markets. It is concluded that improving countries' Logistics Performance Index scores is a complex task that requires comprehensive reforms.

Santiteerakul et al. (2018) examined the logistics performance relationship between the Association of Southeast Asian Nations (AC) and the European Union (EU). The study compares and examines each economy and union based on Logistics Performance Indices (LPI) obtained from the World Bank. The findings show that logistics performance between both EU and AC countries varies greatly. Since the global supply chain is inevitable, uneven performance among and among members of associations can be a major obstacle to future economic development.

Jhawar et al. (2018) found in his study that the transportation infrastructure of country groups has a positive effect on economic growth. In this study, it is stated that international logistics and transportation infrastructure, institutional quality, and low transportation costs contribute to export performance and economic growth by facilitating trade.

Eygü and Kılınç (2020) applied the Ridge regression method in their analysis for OECD countries based on Logistics Performance Index (LPI) statistics. In this study, they determined that there was a significant relationship between the general LPI score and the variables of customs, infrastructure, international transportation, logistics adequacy and quality, and timeliness.

Stojanović and Ivetić (2020) showed how delivery methods in international trade affect LPI scores. In this study, the possibility of improvement through the logistics performance index within the framework of INCOTERMS delivery methods was analyzed. Additionally, emphasis was placed on the facilitation and effective use of international sales contracts.

Göçer et al. (2021) have developed a methodological framework to present logistics strategies for improving the LPI scores of specific countries. The study applies both qualitative and quantitative methods. The data required for the study were obtained from countries' logistics journals, scientific articles, newspapers, World Bank investment reports and Ministry of Transport publications. The framework put forward in the study is very useful for countries to implement and develop their respective logistics strategies.

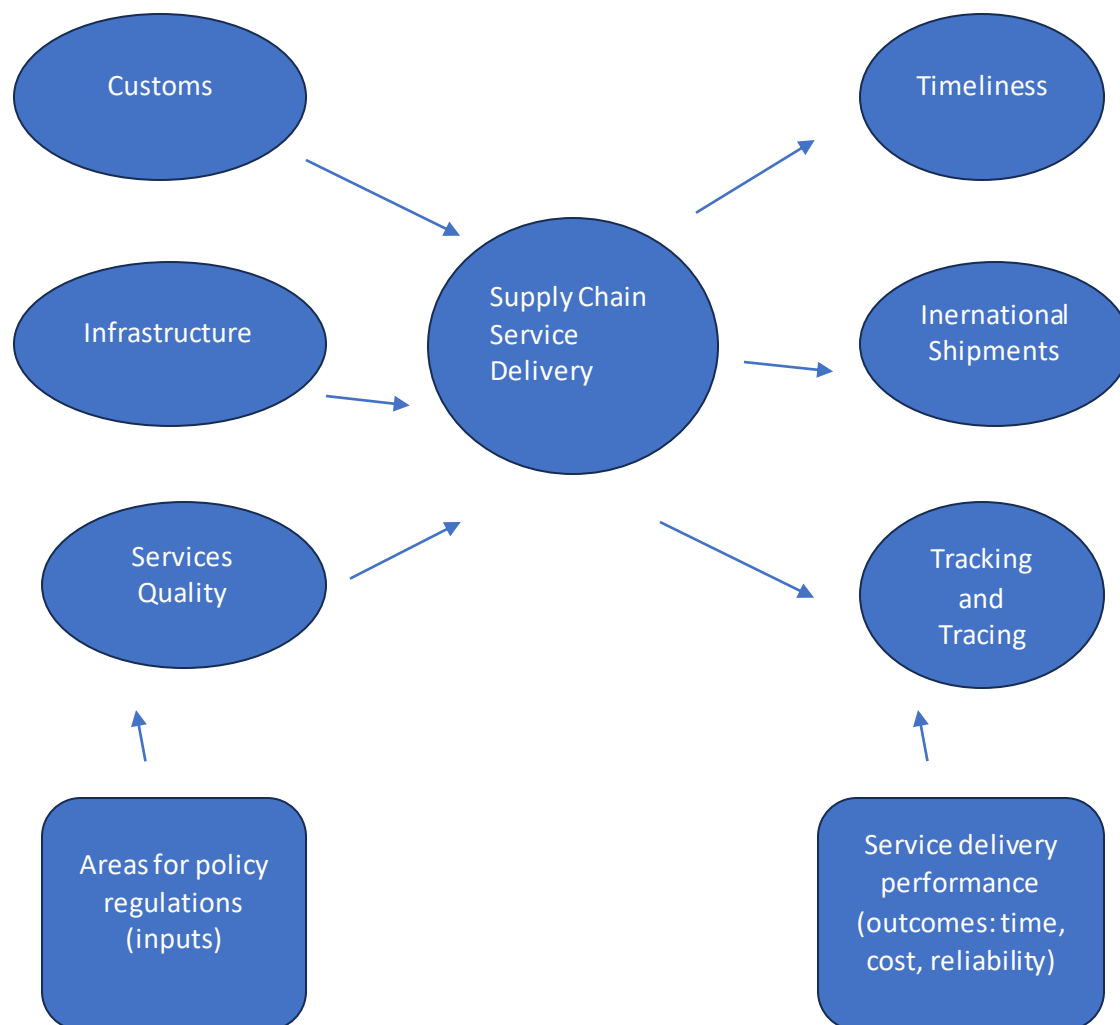
3. LOGISTICS PERFORMANCE INDEX (LPI)

Logistics Performance Index (LPI) is an important resource created by the World Bank in which the performance of countries in the field of logistics is examined and evaluated. The Logistics Performance Index was first published in 2007, and the second one was further developed in terms of technique and scope and published in 2010. Then, the third report was published in 2012 with the same technique and scope as the second report. It was later published in 2014, 2016 and 2018, and finally in 2023. Thanks to the Logistics Performance Index, countries have the opportunity to compare themselves with other countries in terms of international logistics activities and see how they can turn their opportunities into opportunities.

In this respect, the index offers some suggestions to approximately 160 countries on which key areas they should focus on to improve their performance. Logistics Performance Index is basically calculated by the increase rates in countries' trade volumes, export and import amounts and GDP data after 1992. While calculating the index, countries were examined in different groups according to geographical regions and income levels. The index is also obtained by evaluating six particularly prominent performance indicators of countries using principal component analysis and combining them statistically.

Today, improving logistics performance is at the center of economic growth and competitiveness. As it is known, trade is carried out by private operators within and across borders. The components of the Logistics Performance Index measure the efficiency of this supply chain, that is, logistics performance. The performance in question contributes significantly to logistics performance; It is based on the policy framework measured by countries or regional economic groups in terms of infrastructure, legislation, development of services, and trade facilitation practices. Countries that are commercial powerhouses in their own right, such as the Netherlands in Europe or Vietnam and Indonesia in developing countries, see error-free and sustainable logistics as the dynamo of growth and integration into the global value chain. On the other hand, inadequate logistics increases trade costs and reduces the potential for global integration. Inadequate logistics are a heavy burden for developing countries trying to compete in global markets.

The logistics performance index has been discussing the role of logistics in growth since 2007 and the role of logistics support policies in the areas of infrastructure, service delivery and cross-border trade facilitation. Unlike the situation in 2007, when the World Bank began its performance review, today's problem is not the lack of awareness among public and private sector leaders in this area, but the lack of design and implementation of policies that will allow countries to connect to global competition and logistics networks. The December 2013 World Trade Organization Trade Facilitation Agreement signed in Bali, Indonesia, provided evidence of consensus providing guidance on some important policies. However, more efforts are needed considering sustainability (Köksal et al., 2014).

Figure 1: Model of Relationships Between Logistics Performance Index Components

Source: Arvis et al., 2018.

Figure 1 shows the input and output components of the Logistics Performance Index. Among these components, customs, infrastructure, quality of logistics services and competence are included in the input section; scheduling, international shipments, tracking, and tracing are included in the outputs section.

In the latest report of the Logistics Performance Index, more than 6,000 country evaluations and opinions collected by logistics professionals and experts (international company managers) through web-based questions and surveys were examined with six basic components to compare the logistics situation of 160 countries. These basic components are stated below (Arvis et al. 2014);

- The efficiency of customs and border clearance – (Customs).

- The quality of trade and transport infrastructure – (Infrastructure).
- The ease of arranging competitively priced shipments – (Ease of arranging shipments).
- The competence and quality of logistics services—trucking, forwarding, and customs brokerage – (Quality of logistics services).
- The ability to track and trace consignments – (Tracking and tracing).
- The frequency with which shipments reach consignees within scheduled or expected delivery times – (Timeliness).

Within the scope of the index, countries are given scores between one and five, with the highest performance score being five and the lowest performance score being one. Scores between one and five are; logistics performance is divided into four groups: very good, good, medium and poor.

In the World Bank Logistics Performance Index, logistics performance evaluations are created within the framework of six components: customs, infrastructure, ease of arranging shipments, adequacy and quality of logistics services, tracking and tracing and finally timeliness. These six LPE components are basically divided into two groups;

- Areas of policy regulation that include key inputs of the supply chain (customs, infrastructure and quality of logistics services)
- Service delivery performance outcomes (timeliness, arranging shipments, tracking and tracing)

Reliable logistics is a mandatory concept for creating and establishing the global value chain. It also means reaping the benefits of reliable logistics growth and commercial opportunities for poverty reduction. The ability to engage with global logistics depends on countries' infrastructures, service markets and business processes. Governments and private sector organizations in most developed countries must develop these areas or coordinate the high and rising costs in these areas.

4. LOGISTICS PERFORMANCE INDEX (LPI): COMPARISON AND ANALYSIS OF TÜRKIYE AND OTHER COUNTRIES

In this part of the study, Türkiye and other countries were compared according to the Logistics Performance Index general scores. In these comparisons, associations with certain country groups and global formations were taken into account. For example, G7, G20, and BRICS countries were taken into consideration in comparisons.

Table 1: Comparison of G7 Countries and Türkiye in Terms of Logistics Performance Index 2018 and 2023

Country	LPI Score 2018	LPI Rank 2018	LPI Score 2023	LPI Rank 2023
Germany	4,2	1	4,1	3
United States	3,89	14	3,8	17
United Kingdom	3,99	9	3,7	19
Italy	3,74	19	3,7	19
France	3,84	16	3,9	13
Japan	4,03	5	3,9	13
Canada	3,73	20	4	7
Türkiye	3,15	47	3,4	38

Source: World Bank LPI 2018 and 2023.

Table 1 shows the comparison of G7 countries and Turkey according to the Logistics Performance Index 2018 and 2023 overall scores. In this context, when we look at the table, the 2018 and 2023 general LPI scores of G7 countries are significantly higher than Turkey's scores. G7 countries were among the 20 countries with the highest LPI scores in both 2018 and 2023. While Turkey ranked 47th in 2018, it ranked 38th in 2023. Among the G7 countries, Germany ranked first among the G7 countries in both years with its overall scores. The country closest to Turkey in the ranking was Canada in 2018, and the United Kingdom and Italy in 2023.

Table 2: Comparison of BRICS Countries and Türkiye in Terms of Logistics Performance Index 2018 and 2023

Country	LPI Score 2018	LPI Rank 2018	LPI Score 2023	LPI Rank 2023
Brazil	2,99	56	3,2	51
Russia	2,76	75	2,6	88
India	3,18	44	3,4	38
China	3,61	26	3,7	19
South Africa	3,38	33	3,7	19
Türkiye	3,15	47	3,4	38

Source: World Bank LPI 2018 and 2023.

Table 2 shows the comparison of BRICS countries and Turkey according to the Logistics Performance Index 2018 and 2023 overall scores. In this context, when we look at the table, Turkey's logistics performance index score against BRICS countries is better than G7 countries. From this perspective, BRICS countries Brazil and Russia were below Turkey in the rankings in 2018. Among the BRICS countries, China achieved the highest ranking in terms of LPI overall score and ranking in 2018, ranking at the 26th level.

Considering the LPI scores of 2023, Brazil and Russia, among the BRICS countries, are ranked below Turkey in the general rankings. Türkiye caught up with India in 2023 and ranked 38th.

Again, according to the 2023 LPI scores, China and South Africa entered the top 20 with a score of 3.7 and ranked 19th.

Table 3: Analyzing of Türkiye in Terms of Logistics Performance Index Between 2007 and 2023

Country	LPI Score/Rank 2007	LPI Score/Rank 2010	LPI Score/Rank 2012	LPI Score/Rank 2014	LPI Score/Rank 2016	LPI Score/Rank 2018	LPI Score/Rank 2023
Türkiye	3,15 / 34	3,22 / 39	3,51 / 27	3,5 / 30	3,42 / 34	3,15 / 47	3,4/47

Source: World Bank LPI Between 2007 and 2023.

Table 3 shows the analyzing of Turkey according to the Logistics Performance Index between 2007 and 2023 overall scores. Looking at the table, it achieved its best score and ranking in 2012. With an overall LPI score of 3.51, Türkiye ranked 27th in 2012. He later achieved his second best score and ranking in 2014. It ranked 30th with an overall score of 3.5. In fact, when we look at the table from a general perspective, Turkey increased its overall LPI score from 2007 to 2012. Then, starting from 2012, the LPI score started to decline. However, in the recently announced 2023 report, Türkiye increased its score compared to the previous year.

Table 4. Comparison of G20 Countries and Türkiye in Terms of Logistics Performance Index 2023

Country	LPI Score 2023	LPI Rank 2023
Germany	4,1	3
United States	3,8	17
United Kingdom	3,7	19
Italy	3,7	19
France	3,9	13
Japan	3,9	13
Canada	4	7
Türkiye	3,4	38
Argentina	2,8	73
Australia	3,7	19
Brazil	3,2	51
China	3,7	19
India	3,4	38
Indonesia	3	61
Mexico	2,9	66
Republic of Korea	3,8	17
Russia	2,6	88
South Africa	3,7	19

Saudi Arabia	3,4	38
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Source: World Bank LPI 2023.

Table 4 shows the comparison of G20 countries and Turkey according to the Logistics Performance Index 2023 overall scores. There are 19 countries in total in the table. The European Union is a member of the G20, but since there is no general LPI score for the European Union, it could not be included in the list. Looking at this table, Germany achieved the best score among the G20 countries with a score of 4.1 and ranked 3rd in the 2023 LPI rankings. Then the second best score belongs to Canada with 4 points. With this score, Canada ranked 7th in 2023. Among the G20 countries, the lowest score belongs to Russia with a score of 2.6, and with this score it ranked 88th in 2023. The second worst score among G20 countries belongs to Argentina with a score of 2.8, and Argentina ranked 73rd with this score.

When we look at Turkey among G20 countries, it ranked 10th with a score of 3.4. In fact, this score is at an acceptable level when evaluated in general terms. However, Saudi Arabia and India also ranked with the same score as Turkey.

In terms of GDP, the USA, which is the country with the highest GDP among the G20 countries, ranked 17th in the 2023 general LPI ranking with a score of 3.8.

5. CONCLUSION AND IMPLICATIONS

In the research part of the study, Turkey's Logistics Performance Index scores published by the World Bank and the scores of G7, BRICS and G20 countries were compared in certain aspects. As a result of the comparisons obtained in this part of the research, some evaluations and inferences were made in the fields of logistics and supply chain by looking at Turkey's general LPI scores.

First, when we look at Turkey's general LPI scores and rankings, it can be seen that there has been a significant development from 2007 to 2012. There was a partial decrease between 2012 and 2014, but Turkey's general LPI scores showed a higher decrease from 2014 to 2018. From 2018 to 2023, Türkiye LPI scores started to rise again.

Again, when looked at in the light of these scores, Turkey's general LPI scores have remained slightly below the average of G7 countries over the years. Then, it can be stated that Turkey is in a good situation compared to the BRICS countries with its LPI scores. Finally, when Turkey is compared with G20 countries in terms of LPI overall scores, it can be said that it has achieved a better LPI score than almost more than half of the G20 countries.

When the LPI scores obtained by Turkey are examined in terms of the sub-criteria in the index, the customs sub-criterion has an important place for Turkey's logistics infrastructure. It can be said that important studies and improvements have been made regarding customs activities and customs processes in Turkey, especially after the 2000s. In this context, ministries related to

customs systems and processes have carried out important work within the scope of the customs modernization project. Improving inspections at customs gates, improving customs control, and improving documentation work at customs can be cited as examples of customs modernization efforts. Of course, the work done so far is valuable, but more projects and improvements need to be made in this field. When we look at this issue from the perspective of the development of foreign trade, import and export activities in Turkey are increasing day by day and the duties and responsibilities of customs are constantly increasing. Therefore, it is important to transfer customs clearance activities to more digital infrastructures and systems using current technologies. Using technologies such as blockchain, artificial intelligence and the internet of things in customs clearance activities and creating projects for these are among the important studies aimed at increasing Turkey's overall score in the Logistics Performance Index.

The concept of infrastructure, which is one of the sub-criteria of LPI, is undoubtedly very valuable for logistics processes. In this context, IT, ports, airports, connection roads, bridges, etc. throughout the country. Increasing the number of logistics infrastructures such as and improving the existing ones is extremely important in terms of contributing to the country's LPI score. The improvements and developments in GPS and satellite systems carried out by relevant ministries in recent years will have extremely important contributions.

However, the quality of logistics services is an issue that needs to be addressed holistically. Here, businesses operating in Turkey in the logistics and supply chain sectors must always increase their efforts to provide quality service in their logistics processes. Relevant ministries should also support efforts to improve the quality of these logistics services and encourage businesses in these matters.

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