



Türkiye as an infrastructure pivot?

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Between the 2nd century BC and the 15th century, the Silk Road, ending in Istanbul, was the main traditional route between China and the Middle East. Europe has developed since the Renaissance and Istanbul (then Constantinople) and Türkiye have evolved into an ever more important trading and commercial hub between the East and the West up to today. Since the turn of the century, the Turkish government has massively invested in Türkiye's transport and energy infrastructure, to the point that the country is ideally positioned to play a globally unique role as a transport and increasingly an energy hub. Moreover, because of the war in Ukraine and conflict in the Middle East, along with a new geopolitical situation pitching the 'West against the rest,' this process has been accelerated and put Türkiye in the position of an *infrastructure pivot* between the East and the West. From being the terminus of the Silk Road, Türkiye is now at its core again.

In this issue of *Network Industries Quarterly*, we present and discuss the gradual ascent of Türkiye to become a global or at least a regional 'infrastructure pivot,' as we call it. The three articles that make up this issue illustrate the pivotal role of Türkiye in aviation – both through its national flag carrier, Turkish Airlines, and even more so through its newly built Istanbul airport – in gas and railways. These sectors are in different stages of development, with aviation clearly being the most advanced infrastructure pivot, while the potential of railways as a regional infrastructure pivot still needs to be realised. In this introductory article, we briefly highlight and discuss the four main factors that have been contributing and continue to contribute to this evolution.

The first factor is geographical location, which situates Türkiye ideally between the East and the West. Geography was already a key factor during the time of the Silk Road and during the Ottoman Empire, and this is, of course, still true, and today Türkiye's position between the North (Europe/Russia) and the South (Middle East, Africa) adds to it. The importance of Türkiye in global trade developments in recent years indicates that Türkiye is an essential strategic asset and the most suitable commercial, energy and transit corridor between Asia and Europe.¹ The so-called Middle Corridor trade and supply route is gaining more importance, especially with the Russia-Ukraine war, as a major route between Asia and Europe. Russia's war against Ukraine has contributed to the rise of the Middle Corridor as a third vector of Eurasian connectivity which links Europe and Asia via Central Asia, the Caucasus and Turkey.² Moreover, in recent years the investment and trade policies of the Turkish government, global political developments and strategic alliances have strengthened Türkiye's role as a corridor between the global North (especially Europe) and Africa.³ Plans to bypass Türkiye as a corridor and build a trade route going through Saudi Arabia, the United Arab Emirates (UAE), Jordan and Israel will most likely not materialise. As a result, the historical advantages of Türkiye's geographical location are not diminishing but on the contrary have been increasing in recent years.

The second factor behind Türkiye's pivotal role pertains to the massive investments by the government in the past 20 years in infrastructure projects, namely roads, airports, gas, electricity and more recently rail. Indeed, during the past 20 years, Türkiye has undergone a huge expansion in infrastructure.

- The motorway network, which was 1,714 km long at the end of 2002, has reached 3,633 km, and the total dual carriageway network including highways, which was 6,101 km at the end of 2002, had reached 29,063 km by the end of 2022. This expansion is supported by mega projects such as a third bridge over the Bosphorus, an underwater tunnel under the Bosphorus and a bridge over

Çanakkale straight.

- The railway network, which was 10,948 km long at the end of 2002, reached 13,749 km by the end of 2022. Its slow expansion is supported by strategic connections such as the Marmaray line under the Bosphorus connecting Asia and Europe. Türkiye is planning to invest more in railways in the coming years both in passenger (high speed) and freight rail.⁴
- One of the most impressive areas of expansion is air travel. The number of active airports was 26 at the end of 2002 and it had reached 57 by November 2022. Airline terminal capacity, which was 55 million at the end of 2002, had reached 334.7 million by November 2022. The number of countries with air transport agreements, which was 81 at the end of 2002, had reached 173 by November 2022. The total number of international flight destinations, which was 60 at the end of 2002, had reached 342 by November 2022. The total number of airline passengers, which was 34 million at the end of 2002, reached 128.56 million in 2021, despite the pandemic. The number of wide-body aircraft, which was 150 at the end of 2002, reached 589 in November 2022.⁵
- Türkiye is also an important sea transport hub, and in recent years the capacity of its ports has rapidly increased. The number of containers handled in Turkish ports was approximately 2.5 million TEUs (twenty-foot equivalent units) in 2003 but it increased to 12.59 million TEU in 2021.⁶
- Türkiye aims to become the central country in energy trade in its region. With this aim, Turkey has pioneered and implemented important natural gas and oil pipeline projects, namely the Baku-Tbilisi-Ceyhan (BTC) crude oil pipeline, the South Caucasus natural gas pipeline (SCP), the Baku-Tbilisi-Erzurum (BTE) natural gas pipeline, the Turkey-Greece natural gas interconnector (ITG), the Trans Anatolian natural gas pipeline (TANAP) and the TurkStream project. Türkiye's contribution to Europe's energy security reached a new level in 2020: the Southern Gas Corridor, Europe's 4th natural gas artery, came into operation thanks to the Trans Adriatic Pipeline (TAP), which was completed at the end of 2020. The backbone of the Southern Gas Corridor is the Trans-Anatolian natural gas pipeline (TANAP), which passes through Turkey. TANAP is aimed at reaching an annual capacity of 31 billion cubic meters (bcm) in 2026. Another project that has recently contributed to strengthening Türkiye's natural gas security is the TurkStream natural gas pipeline project. This project consists of two pipelines, each with a capacity of 15.75 bcm, under the Black Sea. The first pipeline delivers natural gas to Türkiye, whereas the second pipeline delivers natural gas to European countries. The Turkish Straits also have special importance in terms of global energy security, as approximately 3% of the world's oil supply is transported through the Bosphorus and the Dardanelles.⁷

The third factor contributing to Türkiye's role as an infrastructure pivot is the quality of the management of this infrastructure, together with regulation of it. This is particularly true of aviation but also of energy, but it has not really materialised so far in the railway sector, which still has to undergo some reforms in order to be able to unleash its potential. Indeed, Türkiye has gone through a legal reform process in recent years to support investments in infrastructure. Neo-liberal policies have become widely accepted and a lengthy liberalisation and privatisation process has been undertaken. First, there was de-regulation and re-regulation of

1 <https://politicstoday.org/turkey-east-west-trade/>

2 <https://www.swp-berlin.org/10.18449/2022C64/>

3 <https://www.eliampep.gr/en/publication/%CE%B7-%CE%B1%CF%86%CF%81%CE%B9%CE%BA%CE%B1%CE%BD%CE%B9%CE%BA%CE%AE-%CF%80%CE%B5%CF%81%CE%B9%CF%80%CE%AD%CF%84%CE%B5%CE%B9%CE%B1-%CF%84%CE%B7%CF%82-%CF%84%CE%BF%CF%85%CF%81%CE%BA%CE%AF%CE%B1%CF%82/>

4 <https://www.uab.gov.tr/uploads/pages/bakanlik-yayinlari/ulasan-erisen-turkiye-171122.pdf>

5 <https://www.uab.gov.tr/uploads/pages/bakanlik-yayinlari/ulasan-erisen-turkiye-171122.pdf>

6 <https://www.uab.gov.tr/uploads/pages/bakanlik-yayinlari/ulasan-erisen-turkiye-171122.pdf>

7 https://www.mfa.gov.tr/turkiye_nin-enerji-stratejisi.tr.mfa

almost all the network industries, such as energy, telecom and the various transport sectors. This was followed by an extensive legal reform that led to the creation of independent regulatory authorities and corporatised state-owned enterprises (SOEs). Later, most of these SOEs were privatised. This process attracted private funds to the Turkish network industries. The newly privatised SOEs together with new entrants to the different markets created an efficient corporate governance structure. For example, in the electricity market the state-owned generation capacity was reduced to less than 20 per cent. Moreover, state-owned transmission companies (TEİAŞ) and Energy Exchange Istanbul (EXIST) were restructured as modern companies. This restructuring process was successful in some sectors, such as electricity and air transport, while the process has been slow in other sectors, such as gas and rail transport. Probably the most successful sector was air transport. Turkish Airlines is indeed a success story. It is a fully private company listed on the Istanbul Stock Exchange, and even though majority control belongs to the state it is managed according to industry best practices. At the same time, the three main airports, Istanbul, Sabiha Gökçen and Antalya, are managed by private operators, while small airports are run by the state-owned company DHİM with the same governance principles.

The fourth factor contributing to Türkiye's pivotal role in infrastructure is geopolitics, luck and political savvy. Türkiye is the 17th biggest economy in the world with a strong domestic market and a market economy. It is certainly the most stable state in its region. Moreover, recent events in international politics, namely the war in Ukraine and the Israel-Palestine conflict, have further reinforced Türkiye's role as an infrastructure pivot in the region.

*Muzaffer Eroglu
Matthias Finger*

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Managing editor | Natalia Gortazar

Publishing editor | Ozan Barış Süt

Founding editor | Matthias Finger

Publisher | Florence School of Regulation, Transport Area, Via Giovanni Boccaccio 121, 50133, Florence, Italy, phone: +39 055 4685 795, email: FSR.Transport@eui.eu and Istanbul Center for Regulation, Istanbul Technical University, Taşkışla, 34367 Istanbul, Turkey, email: info@ic4r.net

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Türkiye as an aviation infrastructure pivot

İsmail Hakkı Polat,* Dr. Atınç Tunali,**Dilan Uzunkodalak Aksoy***

Over the last four years, Istanbul Airport has set many records. By the end of 2023 almost 500,000 flights will have taken place in the year, with 80 million passengers using the airport. Consequently, IST has become the airport with the most passengers in Europe and the second most passengers in the Middle East. This is the combined result of an ideal geographical location, forward-looking investments, a well-planned and well-executed greenfield approach and a new geopolitically advantageous position.

Intro
In global academic aviation analyses it is generally accepted that the 'centre of gravity' of aviation has shifted eastwards over the last four decades. Historically, growth in aviation was strongest in North America and Western Europe. However, with growth in the Middle East and emerging Asian economies in recent years being higher than that in more mature aviation markets, the overall centre of gravity has moved.

A Comparative Assessment of the Market

In essence, the Turkish Government is pro-aviation and has overseen a doubling of the number of airports in the country to 55 in the past decade. The government is also considering building more to ensure that no citizen is more than 100 km (62 miles) from an airport. Additionally, unlike the Middle East hub airlines, Turkish

Airlines has a large population demographic and a large domestic network, with around two-fifths of its passengers travelling within the country. Its traffic grew by 9.6% CAGR between 2012 and 2019, faster than its peer airlines. The Gulf hub airlines grew faster than the European hub airlines, with Qatar Airways growing by 9.2% CAGR, Etihad by 7.9% CAGR and Emirates by 5.2% CAGR. The major European hub airlines have experienced slower growth, particularly Air France with -0.5% CAGR and Lufthansa, which has also seen its traffic reduce by 0.5% CAGR. The rapid growth of Turkish Airlines has happened despite the infrastructure constraints of the old Atatürk Airport. Since 2016, Turkish Airlines has overtaken Lufthansa as the largest hub airline in the Middle East and Europe. The opening of Istanbul airport has removed

further infrastructure constraints, allowing the full growth potential of Turkish Airlines to be realised.

Turkey's annual seat capacity grew by 4.4 times from 2006 to 2019, almost twice the growth rate of the Middle East and Asia. Since 2015, the growth situation has been very different, with Turkish growth of 3.9% CAGR between 2015 and 2019 being lower than Asia at 7.9% CAGR, Europe at 5.2%, the Middle East at 4.8%, Africa at 4.6%, and North America at 4.2%, due to the political instability and terrorism experienced in Turkey in 2016. Turkey's largest airports (Istanbul Atatürk -ISL- and Istanbul Airport -IST- from April 2019) have seen a 6-fold increase in traffic since 2002, with growth of 7.9% CAGR from 2009 to 2019. Between 2009 and 2019, the second Istanbul airport, Sabiha Gökçen SAW, grew by 18.9% CAGR following terminal expansion and subsequent development by Pegasus Airlines. The airport handled 35.6 million passengers in 2019, making it the third-largest airport in Turkey.

In terms of investment size, there is no project comparable to IST except the nuclear power plant planned to be established in Mersin Akkuyu with a budget of approximately 20 billion euros. To make another comparison, the investment required to establish TÜPRAŞ (Türkiye Petrol Rafinerileri A.Ş.), Turkey's largest company and industrial investment in terms of turnover, from scratch is approximately 10 billion euros at the highest, equal to IST. It should be kept in mind that the cost of the TÜPRAŞ Fuel Oil Conversion Facility, which constitutes the country's largest single-item industrial investment, is around 2.8 billion euros. On the other hand, while the direct employment created by IST is 100,000 people, the employment created by TÜPRAŞ, a giant in its field, is below 5 thousand.

* Istanbul Airport, Deputy General Manager(Planning)

** Istanbul Airport, Head Of Airport Planning

*** Istanbul Airport, Airport Planner

The Fundamental Advantage of Istanbul Airport

Istanbul Airport, with an investment cost of 10.25 billion euros, is the largest infrastructure investment project in the history of the Republic of Turkey, and ranks among its important mega-projects. The airport was built on an area of 76.5 million square metres in the northern part of the European side of Istanbul, where urban development and expansion are relatively weak, 35 km away from the city centre. It covers the villages of İmrahor, Tayakadın, Yeniköy, Ağaçlı, Akpınar and İhsaniye.

When all the phases are completed, it is expected to be the largest airport in the world, with 9 runways, 16 taxiways, 500-aircraft parking capacity, 2 main terminal buildings, 3 air traffic control towers, cargo and general aviation terminals, a government guesthouse, a car park, an aviation medical centre, hotels, etc. Phase 4 was planned to reach a passenger capacity of 150 million and this can be expanded to 200 million. The first phase, operating with 90 million passengers, was officially opened on 29 October 2018, when Istanbul Airport started operations. With the completion of the entire project, the planned capacity of Istanbul Airport is approximately 50 million passengers more than Hartsfield Jackson Atlanta International Airport (ATL), which is currently the world's busiest airport with 150 million passengers a year. This comparison shows the scale of logistics and commercial value that IST represents in terms of capacity.

According to Airports Council International annual reports, ATL has maintained this position since 1998. The 2022 passenger traffic at London Heathrow (LHR), which is Europe's largest transfer hub airport in terms of traffic, is 61.6 million. Therefore, Istanbul Airport is a standard setter in its field with the magnitude of the potential offered by its infrastructure.

The lack of investment by European countries in future airport capacity expansion, together with further delays in the expansion of Dubai's Al Maktoum Airport, could be advantageous for Istanbul IST. It is expected that in the medium term Istanbul IST will continue to surpass the infrastructure capabilities of other major hubs, thus having the potential to capture the majority of the intercontinental transfer share at the expense of European hubs. Dubai Airport DXB has undergone construction, which has expanded its capacity to develop to a maximum of circa 115 million passengers today. Beyond this level, the capacity plan for Dubai DXB is uncertain given the postponement of the full expansion of Dubai World Central. This gives

Istanbul IST/Turkish Airlines a head-start advantage in raising its profile to be the world's new hub airport by offering the next generation of world-class hub services and operations at the new airport.

Istanbul IST/Turkish Airlines have a competitive advantage compared to Dubai DXB/Emirates in potentially capturing a future international transfer market share. Already, Istanbul IST serves more cities than its Middle East rivals, with a mix of primary, secondary and tertiary cities, particularly in Europe, Africa, the CIS and Asia. Turkish Airlines is particularly strong in connecting Europe, the Middle East, and Africa to the rest of the world compared to other European/Middle East hub airlines. Turkish Airlines is expected to continue developing its strength in these markets, especially with the future potential of African regional transfers developing more niche competitive advantage.

The main reason for the diverse network development is its advantage of being located at the centre of gravity of air traffic in the confluence of the European, Asian and African regions, enabling wider use of narrow-body aircraft. While in theory larger wide-body aircraft could have lower unit costs, it will only work if passenger loads are sustainably high enough throughout the year and the destination range is optimal. In smaller primary and secondary markets such as European regional cities, most emerging African cities and eastern European countries where loads are relatively low and seasonal, Turkish Airlines' narrow-body fleet will be more able to balance demand and capacity, with the added advantage of introducing more frequency with less risk.

Airlines operating higher frequencies will be able to command higher yield premiums and at the same time provide a better hub transfer product. From an operational point of view, Turkish Airlines will have less exposure to risk in expanding its network reach across more cities in Europe, Africa, the Middle East and the CIS compared to Qatar Airways at Doha DOH and Emirates at Dubai DXB, which both heavily rely on a widebody aircraft strategy. It is expected that Turkish Airlines will proceed with the next wave of wide-body aircraft orders in the new decade once traffic recovery takes shape to supplement the short-haul network reach. Coupled with the support of its strong and large origin/destination and domestic market, and the centrality of Istanbul's hub location, Turkish Airlines at Istanbul IST is expected to be in a better competitive and resilient position compared to its rivals and is likely to further increase its market share of global traffic.

Conclusion

Istanbul, with a population of over 14 million, is Turkey's largest city and hosts one of Europe's largest airports. In terms of passenger numbers in 2023, Istanbul Airport ranks first in Europe and second in the Middle East.

Positioned in an intercontinental city extending to the strategically vital Bosphorus Strait, Istanbul Airport operates synergistically with Turkey's strategic transport aims. Beyond the high demand for commercial and historical centres, Istanbul's strategic location on the historic Silk Road has profoundly influenced aviation dynamics by centralising its position in the air networks connecting Europe to the Middle East/Africa/Asia.

Explaining this success solely through location and positioning would be incomplete. Technological advances constitute another crucial element in this triumph. In particular, many systems used in its operations were pioneered by IST airport engineers defining and standardising sector-specific requirements before industry positioning and international standards were established. In addition, a noteworthy factor is the proactive response to crises that fundamentally shook the foundations of aviation, such as the Covid pandemic. During the crisis, Istanbul Airport not only undertook a proactive struggle but also became a gateway opening to the world, carrying the aviation load for Europe.

In conclusion, combining crisis management and organisational strategies during challenging times with technological advances, Istanbul Airport has evolved into an organisational structure shaping global aviation. By successfully shifting the centre of world aviation towards the east, it has established itself as a flagship pivot, earning recognition as the central hub of European aviation's eastward expansion.

To Be or Not to Be ‘A Gas Hub’: The Case of Türkiye

Dr, Bağdagül Kaya Caner, LL.M

Introduction

In energy markets, there are some terms that are often used synonymously, such as *gas hub*, *gas exchange*, *trading platform* and *virtual trading point*. These terms are sometimes quite hard to distinguish from one another since they play complementary roles with each other and in some cases they co-exist.

First and foremost, it is possible to define a *gas hub* as a physical interconnection point or points where different gas sources meet or are pooled in a natural gas transmission network or zone in order to be traded either physically or virtually. This involves several pipelines or liquefied natural gas (LNG) terminals potentially competing with each other in price terms. In other words, a gas hub is not only a crossroads where pieces of natural gas infrastructure meet but also a market place where natural gas is traded via a virtual trading point, a trading platform or an exchange while creating a reference price. Therefore, to be a successful gas hub requires a gradual yet natural or inherent transformation process in terms of both an amplified natural gas infrastructure system and a solid legal and regulatory framework. In other words, it is not a *self-contained regime*² it has to be built on a set of deep-rooted market rules. This is the main distinction between natural gas hubs and inter-governmental cross-border pipeline projects.

International trade necessitates legal certainty since medieval times when *lex mercatoria* was created³. The first in-

ter-governmental agreements and related natural gas sale and purchase agreements date back to nearly fifty years ago. They established rights and obligations of natural gas buyers and sellers on a long-term basis such as for a duration of twenty years. However, after the natural gas market liberalisation in Europe in the 2000s, cross-border natural gas trade patterns changed and trading terms were even reduced to a daily basis. Therefore, in the era of liberal natural gas, network-bound natural gas trade also requires regulatory rules and certainty.

Being at the crossroads of continents in the heart of ancient spice routes, also known as the Maritime Silk Road is a blessing for natural gas transport and trade for Türkiye in terms of both pipeline gas and LNG. The natural gas transmission infrastructure stretches from the Middle East through the Caspian Sea and Siberia to Türkiye. Five LNG receiving terminals which have been either newly built or have had their capacity expanded offer Türkiye the possibility of receiving LNG from various price and trade points. Türkiye presents unparalleled physical conditions that one country might offer, however these are necessary but not sufficient on being a gas hub since a gas hub is also a marketplace with multiple parties trading under well-defined regulatory and commercial rules. Given its physical situation, the natural gas market liberalisation process, which was initiated by the Natural Gas Market Law 2001 (NGML) and continued with a pioneering regulatory framework that provides access to the Turkish natural gas system and trade in it with the possibility of spot and forward natural gas transactions, can elevate Türkiye to being not only a regional gas hub but also a global one.

Türkiye as a Natural Gas Market

Türkiye is one of the most significant markets in the region given its consumption of natural gas. With its annual consumption in 2022 of 53.5 billion cubic meters (bcm), Türkiye ranks 4th in Europe and 16th in the world. Tür-

1 Head of Group, the EMRA. Views, thoughts, and opinions expressed in the text belong solely to the author, and not necessarily to the author's employer, organization.

2 A self-contained regime is the case in which a set of primary rules relating to a particular subject matter is connected with a special set of secondary rules that take priority over the secondary rules provided by general law. Koskenniemi, M. (2006), Fragmentation of International Law: Difficulties Arising From The Diversification and Expansion of International Law, United Nations, Report of the Study Group of the International Law Commission, Document A/CN.4/L.682 and Add.1, pp. 31 ff. https://legal.un.org/ilc/documentation/english/a_cn4_l682.pdf

3 Volckart, O. and Mangels, A. (1999), Are the Roots of the Modern Lex Mercatoria Really Medieval? Southern Economic Journal Vol.

65, No. 3, pp. 427-450.

kiye is one of the 10 largest LNG importers in the world. By the end of 2022, the number of natural gas consumers was approximately 19.7 million, of which 19 million were subscribers and 726 thousand eligible customers.⁴

Türkiye provides natural gas from both its local reserves and from abroad, with long-term purchase contracts with the Russian Federation, Algeria, Iran and Azerbaijan together with spot and long-term LNG imports. Although, natural gas production has been limited in Türkiye it is expected to have risen in 2023 with recently discovered Black Sea reserves coming on the market. The Turkish Petroleum Corporation (TPAO) discovered 135 bcm of natural gas in the Amasra-1 well in the North Sakarya Field. Hence, with the addition of this to the previously discovered volume of 405 bcm in the Sakarya Gas Field, the total gas reserves discovered in the Black Sea reached 540 bcm.⁵ Furthermore, according to a recent government announcement the total amount discovered has increased to 710 bcm.

In 2022, import and wholesale companies operating in the natural gas market injected approximately 56.18 billion Sm³ of natural gas into the transmission network through 13 entry points (M. Ereğlisi LNG Terminal, Dörtüyl FSRU, Durusu, Doğubeyazıt-Gürbulak, Azerbaijan-Türkgözü, EGEgaz Aliğa LNG, K Marmara-Değirmenköy Depot, TPAO Çayağzı, ETKİ LNG, Tuz Gölü Depot, MARSA Gelibolu, TANAP Seyitgazi, Kıyıköy). Türkiye's natural gas storage capacity is also rapidly increasing.

By the end of 2022, the total underground natural gas storage capacity had reached 5.8 bcm. Approximately 56.84 billion Sm³ of natural gas was transported from the transmission network in 2022.⁶ There are currently two underground storage facilities, two LNG land terminals and three floating storage and regasification units (FSRUs) active in Türkiye. The increased regasification capacity of the LNG terminals as a result of upgrades to the terminals and the new FSRUs is another step towards source and price diversity and liberalisation in the natural gas market.

In 2022, imports from Russia were 21.6 bcm, accounting for 39.5% of total imports. A significant amount of imports, around 6.5 bcm (11.9%), was through spot

contracts. Türkiye imported 9.4 bcm of pipeline gas from Iran, which corresponds to 17.2% of its total imports. Azeri gas, of which 6 bcm is through long-term contracts and 2.7 bcm is through spot contracts, made up 15.9% of total imports. In 2022, LNG imports reached 15 bcm, accounting for 27.4% of total imports. Besides 5.3 bcm (9.6%) of LNG imported from Algeria through a long-term contract in 2022, 9.7 bcm spot LNG was imported from countries such as the USA (5.6 bcm, 10.3%) and Egypt (2.2 bcm, 4.1%), accounting for 17.8% of total imports. 581 mcm natural gas was exported to Greece in 2022, an increase of 52% with respect to 2021 (383 mcm). The amount of exports is expected to increase in the next few years as a result of the capacity increase and bi-directional flow investments at the interconnection points.

In June 2018, the Trans-Anatolian pipeline project (TANAP) was physically connected to the Turkish transmission system and the gas flow from Azerbaijan entered Türkiye from this point. Construction of the Turkish Stream pipeline was completed in 2020 and imports from this point have started.

Türkiye As a Natural Gas Trading Hub

Several natural gas price reference points have been prevalently used in the natural gas trade since the 2000s. Among them are the Henry Hub in the United States, the National Balancing Point (NBP) in the United Kingdom and the Dutch Title Transfer Point (TTF). Using a reference price in the natural gas trade was a common practice even before the liberalisation of gas markets. However, sale and purchase agreements were mostly linked to transmission pipeline projects and the price formulas reflected the trade between the buyer and the seller and were part of long-term trade for 15-25 years and the reference prices were mainly driven by oil indexation.⁷

In Europe after the introduction of third-party access rules to transmission networks, although there remained long-term sale and purchase agreements that included so-called '*grandfather rights*',⁸ the remaining network capacities were opened to third parties enabling natural gas trade with new contracts. The new contract types in natural gas markets in the NBP and TTF evolved around the idea of

⁴ Energy Market Regulatory Authority (2023), Natural Gas Market 2022 Sector Report p.4.

⁵ TPAO Press Release (2021), <https://www.tpao.gov.tr/file/2201/20210604-tp-amasra-1-discovery-eng-66361e0331ced70c.pdf>

⁶ EMRA, (2023), Natural Gas Market 2022 Sector Report, p.38.

⁷ Kaya Caner, B. (2021), Enerji Yatırımlarında Uluslararası Tahkim, Ankara Üniversitesi Sosyal Bilimler Enstitüsü Doktora Tezi, p. 32 ff.

⁸ Kaya, B. (2007), Avrupa Birliği Elektrik ve Doğal Gaz Piyasalarında Rekabet ve Türkiye'ye Yansımaları, Ankara Üniversitesi Sosyal Bilimler Enstitüsü Yüksek Lisans Tezi, p. 94.

delivering natural gas at a virtual point making it possible to transfer the title to the gas within the transmission network⁹. The nucleus of this trade had been at first for balancing purposes. Then it expanded to be a reference for trade in spot and forward markets.

In the case of Türkiye, after the entry into force of the NGML, third party access to the transmission network was introduced, and access is regulated and further reinforced by powers vested in the Energy Market Regulatory Authority (EMRA). The Network Code of the ex-incumbent BOTAŞ was approved by the EMRA in 2004 and can only be amended by the EMRA. Since then, an important milestone was reached in 2011 with the introduction of over-the-counter trade for the delivery of gas at the virtual national balancing point in the network. The initial version of the network code was very similar to Ireland's network code. Years later in 2018 it was amended by the EMRA in line with the UK example and the Balancing Network Code of the European Union.

The Organised Natural Gas Wholesale Market by-law enacted in 2017 established a continuous trading platform (STP), which allowed market players to trade natural gas anonymously in an organised liberal market operating with continuous trading principles. It also allowed the transmission system operator (TSO) to balance the system. The STP became operational on 1 September 2018. The market design of the EMRA is based on the continuous trading principle. It allows import, wholesale and export companies to perform day-ahead and intraday operations in a single trading range in order to increase the depth of transactions in the natural gas market and the amount of tradeable gas.

The spot trade carried out on the STP is based on instantly and anonymously matching bids and offers. The daily reference price, which is the weighted average price of day-ahead and intra-day operations for the particular gas day, is published daily by the market operator. The organised market lets the TSO supply balancing gas from the STP as a residual balancer, which results in market-based pricing of the balancing gas and reduces the asymmetry between the electricity and natural gas markets, aiding the prevention of activities that would damage the market structure and security of supply.

At the end of 2017 the tariffs at LNG terminals including FSRUs were liberalised in line with NGML articles dictating that storage tariffs should be freely set between the parties provided that there is sufficient capacity to meet current demand and a higher level of competition in the market. Founding the first organised natural gas market in the area was an important step towards the aim of making Türkiye an international gas trading centre. At the end of August 2023 the total transaction volume in the organised market reached 45 billion TRY (3.4 billion USD) and the amount of natural gas traded was around 8.1 bcm. During the first five years of the organised market, 51 licence holders participated in the market and more than 39 thousand matchings were cleared. In the organised gas market, the price of natural gas is determined objectively and transparently, and the daily reference price on the STP is an indicator of the Turkish reference price.

A natural gas futures market (VGP) started operation on 1 October 2021. The new market allows trade in physically settled natural gas products and is expected to increase market depth and competition and provide market players with a tool for risk management and hedging. Annual, quarterly and monthly futures contracts traded on the market will increase transparency and price discovery in the market, and will therefore be an important step towards Türkiye's aim of being a regional gas trading hub.

For this purpose, in 2018 the NGML was amended to allow spot imports through pipeline entry points, and a regulation determining spot pipeline import methods and quantities came into force in September 2019. The regulation allows licence holders to reserve annual, quarterly and monthly import capacities. Spot import capacity auctions are conducted monthly on the platform and are implemented and operated by the EMRA. The first spot pipeline imports were realised in 2020 through the Malkoçlar interconnection point by two private firms utilising spot capacities allocated in capacity auctions held by the EMRA. In 2021 the first capacity reservation for spot imports from Azerbaijan through the Türkgözü interconnection point was finalised. Between 2020 and 2023, through the Malkoçlar interconnection point, the Türkakım entry point and the Türkgözü interconnection point the total amount of spot imports through pipelines was 16.9 bcm.

Moreover, with an article introduced into the NGML in 2020, the EMRA was vested with the power to oblige market players to sell a certain amount of gas in the organised market. EMRA obliged spot pipeline gas importers

⁹ Kaya Caner, B. (2013), The Evolution of the European Natural Gas Wholesale Markets – The Agreements Utilized Within the New Market Structure, *Enerji Hukuku Dergisi*, 2(2), p.5.

to sell twenty per cent of the gas they imported in the organised market in order to deepen trade in the EXIST, natural gas exchange. With the same law, the EMRA was also given a legal mandate to choose a market maker or makers in the organised market.

Conclusion

Considering the new pipeline projects and the rapidly increasing spot LNG trade in Türkiye, utilisation of spot pipeline gas as a strategic instrument in cross-border trade is essential to improve the status of Türkiye in international natural gas markets. Along with the substantial natural gas discovery in the Black Sea in 2021 and investments in natural gas infrastructure in recent years, the flexibility provided by the organised spot gas market and the increase in cross-border trade created by new EMRA regulations are expected to be immensely beneficial for Türkiye's aim to become a regional natural gas trading centre.

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Turkey as a Strategic Infrastructure Hub: The Significance of Railways

Ali Osman Solak¹

In the last twenty years, Turkey has increasingly focused on enhancing rail transport. The government has dedicated significant resources to various aspects of the rail sector, including a high-speed rail network, modernising and expanding conventional rail infrastructure, and constructing logistics centres. The aim is to improve domestic rail transport and connect to international corridors. This paper evaluates whether recent investment is enough to achieve the government's ambitious objectives. While commendable efforts have been made to promote rail transport, additional investment is necessary.

Introduction

In the last twenty years, Turkey has made impressive strides in enhancing its railway industry. This achievement can be attributed to implementation of liberalisation policies, sector restructuring and substantial infrastructure investment. The central aim of these initiatives is to elevate the significance of rail transport in the national transport system and establish a formidable presence in the global transport sector. This study aims to assess the efficacy of this rail investment by presenting pertinent data and analysing recent progress.

Rail investment and rail network development in Turkey

After the Ottoman Empire dissolved in 1923, the Republic of Turkey inherited an extensive railway network spanning over 4,000 kilometres. Turkey invested heavily in expanding the network to connect major cities and industrial hubs, resulting in the construction of more than 3,000 kilometres of new lines, almost doubling the length of the railway network.

Unfortunately, the outbreak of World War II had a negative impact on railway investment, leading to only 290 kilometres of new lines being built between 1940 and 1950. Expansion of the rail network slowed down significantly as governments after 1950 prioritised expansion of the road network. Between 1950 and 2000, the railway network was only extended by 1,000 kilometres, leaving many cities and manufacturing centres without rail connections.

Insufficient investment also resulted in outdated infrastructure and a decline in the quality of rail services, leading to a significant decrease in market share for both the passenger and freight sectors. In the 1950s, rail

transport accounted for almost 50% of passenger traffic and 80% of freight traffic. However, by 2000, these shares had significantly dropped to 5.5% and 2.3% respectively.

Since 2002, Turkey has made significant investment in its rail transport infrastructure (see Figure 1). The country has dedicated substantial funds to high-speed rail, with the aim of offering an alternative to long-distance road travel and bolstering rail passenger numbers. The Ankara-Eskisehir high-speed rail line, which opened in 2009, was Turkey's inaugural high-speed rail route and forms part of the Ankara-Eskisehir-Istanbul high-speed rail project. At present, the high-speed rail network spans 1,460 km, linking major urban centres. Additionally, Turkey has over 1,500 km of high-speed rail lines under construction, including the 405 km Ankara-Sivas project and the 508 km Ankara-Izmir project.

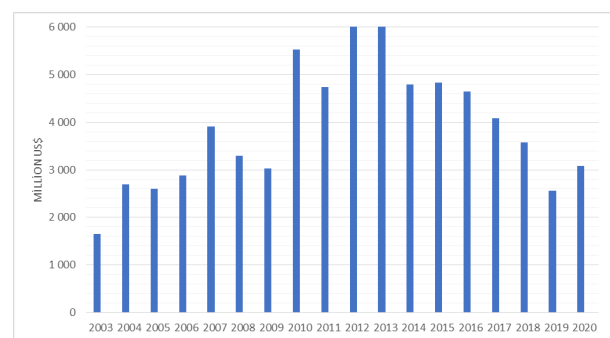


Figure 1. Railway investment (expenditure deflated to 2022 prices). Source: Ministry of Transport and Infrastructure (2023).

Alongside high-speed rail, Turkey has also made remarkable progress in promoting conventional rail transport, specifically for freight. To this end, several conventional rail projects have been implemented, resulting in expansion of the railway network by 564 km of main lines and 156 km of branch lines (see Table 1). A signif-

¹ Professor, Department of Public Finance, Bolu Abant İzzet Baysal University, aliosmansolak@ibu.edu.tr

icant amount of funds has been allocated to modernise infrastructure and acquire new rolling stock. The length of lines with a signalling system in the conventional rail network has notably increased from 2,505 km to 7,235 km, and that of electric lines has expanded from 2,122 km to 6,244 km. Moreover, 12 logistics centres have been established in regions characterised by high freight volumes. These are pivotal in enhancing logistics capacity and fostering the development of intermodal infrastructure.

Table 1: The Turkish rail network, 2000–2022.

Year	Conventional main lines	Branch and station lines	Total conventional lines	HSR	Conventional rail passengers
2000	8,671	2,251	10,922	-	10,922
2002	8,671	2,277	10,948	-	10,948
2005	8,697	2,287	10,984	-	10,984
2010	8,722	2,330	11,052	888	11,940
2015	8,947	2,372	11,319	1,213	12,532
2020	9,194	2,396	11,590	1,213	12,803
2021	9,158	2,432	11,590	1,432	13,022
2022	9,235	2,433	11,668	1,460	13,128

Source: Prepared by the author using data from TCDD (2023a).

Turkey has made significant strides in developing its railway infrastructure, but there is still much to be done. Rail services remain limited to certain cities, and 32 of the 81 provinces lack any connection to the railway network, including major production centres. Integration of the rail network into the last mile needs to be better addressed, with only a few industrial areas, ports, and piers currently having railway connections. Some parts of the infrastructure require modernisation and unfortunately have not received new investment. Currently, 48% of the lines are electrified, and 55% have a signalling system installed. The World Bank (2020) emphasises the importance of establishing branch lines and sidings to connect the rail network with various logistics clusters such as industrial zones, free zones, seaports and logistics parks. Relatively less costly connection roads can bring about a significant modal shift in freight transport.

Despite recent increases in investment, Turkey still spends a disproportionate amount of funding on road construction rather than rail transport. Investment distribution data show that 65.8% of total investment is directed towards roads, while only 23.2% is allocated to rail (see Table 2). Therefore, although Turkey has made

strides in railway development, there has not been a significant shift in investment priorities.

Table 2: Total investment by transport mode between 2003 and 2022.

Transport mode	Investment (billion TL)	Investment (billion USD)	Percentage
Road	1051.10	63.47	65.8%
Rail	370.80	22.39	23.2%
Air	153.60	9.28	9.6%
Sea	21.50	1.30	1.4%
<i>Total</i>	<i>1,743.00</i>	<i>105.25</i>	

Source: Ministry of Transport and Infrastructure (2023).

Note: The 2022 average dollar exchange rate of 16.56 Turkish Lira is used.

Insufficient financial resources: a major obstacle to Turkey integrating in emerging international rail corridors

Efficient transport routes are essential for international trade, and Turkey’s location at the crossroads of Europe and Asia gives it a crucial role in the Middle Corridor. This corridor connects western China with Europe, making Turkey an essential player in the global transport network. To fully leverage its position, Turkey must prioritise meeting infrastructure requirements and ensure seamless integration between different modes of transport. This includes prioritising railway projects that reduce travel distances and eliminate bottlenecks along international routes. Failure to address these challenges could lead to businesses searching for alternative routes, resulting in Turkey missing out on the vast potential of Euro-Asian transit transport.

Turkey has made significant progress in improving its railway infrastructure, particularly in the Middle Corridor. These efforts include successful completion of the Baku-Tbilisi-Kars (BTK) railway line in 2017, the Marmaray Tube Passage project connecting Asia and Europe, and the ongoing Edirne-Kars high-speed rail initiative. The integration of the BTK railway line with the Trans-Caspian International Transport Route is particularly crucial as it creates the most efficient and cost-effective railway corridor from China to Europe. Despite these notable achievements, Turkey still requires substantial investment in infrastructure to fully

leverage its strategic location and integrate into international transport networks.

To realise its vision of a well-connected railway network that seamlessly integrates with global corridors and modernises its infrastructure, Turkey has set ambitious targets. However, financing these plans has proven challenging. While legislative reforms have enabled private companies to enter the railway sector, both domestic and foreign investors have been hesitant to invest. Consequently, Turkey has turned to foreign loans and secured substantial financial assistance from China and European countries to carry out its railway projects.

For example, the European Union has provided substantial financial assistance, including over 1.5 billion euros in loans and grants, for the construction of the Ankara-Istanbul high-speed line. China has also contributed to the financing of this project with a loan of 750 million dollars. The Halkali-Ispartakule-Çerkezkoy railway line has received financial support from the European Bank for Reconstruction and Development (EBRD) and the Asian Infrastructure Investment Bank (AIIB). Chinese companies have expressed interest in the Turkish logistics sector, as is shown by their acquisition of a 65% stake in Kumport, the country's third-largest container terminal. Moreover, the Mersin-Adana-Gaziantep high-speed railroad line, currently under construction in southern Turkey, has received financial support from UK Export Finance (UKEF) in the form of a loan of EUR 781 million. Additionally, Standard Chartered Bank and Credit Suisse in cooperation with UKEF will provide a loan of EUR 2.4 billion to finance the Ankara-Izmir high-speed rail project.

It is expected that European countries and China will continue to provide financial resources to accelerate the progress of the Middle Corridor, which is essential to ensure safe, efficient, and economically viable transport. However, the complex nature of these initiatives may have implications for international relations, and potential disruptions in global diplomatic ties could hinder the provision of loans.

The impact of recent rail investment on rail passenger and freight traffic

Turkey has made a significant investment in high-speed trains to enhance domestic passenger transport, leading to a transformative effect on travel patterns and

purposes, particularly in inter-city tourism. As a result, the number of tourists traveling between cities has notably increased. Additionally, high-speed rail has played a crucial role in determining choices related to education and employment, with more people opting to use these trains for daily commuting instead of relocating to another city for work or education (Yazıcı, 2020).

Since their inception in 2009, high-speed trains have become a popular alternative to buses, resulting in fewer daily bus trips on high-speed routes. Moreover, high-speed rail availability has attracted passengers who would otherwise have driven, creating new demand for these train lines. Consequently, the share of rail transport in passenger travel has significantly increased following the introduction of high-speed lines. For instance, on the Ankara-Eskisehir route, the share of rail in passenger traffic has surged to 72 percent. Similarly, on the Ankara-Konya line, the share of rail transport reached 66 percent after implementation of high-speed transport. It's worth noting that on the Ankara-Istanbul line, a crucial route for passenger transport in the country, the share of rail transport has increased from 10 to 15 percent. Lastly, on the Konya-Istanbul high-speed line, the share of rail transport has risen from five to 17 percent.

Completion of ongoing high-speed rail projects is expected to further enhance the network effect of high-speed rail services. These developments hold promise for Turkey's long-distance passenger transport market, which is currently dominated by private cars and coaches. However, it is essential to note that high-speed trains only make up a small fraction of Turkey's transport system and serve a limited number of cities. For a significant shift in transport modes, Turkey needs to expand its high-speed rail network.

In terms of freight transport, the volume of rail freight transport in Turkey has almost doubled in the last two decades, with the total amount of freight transported by rail amounting to 16.19 billion ton-kilometres in 2022, compared to 8.67 billion ton-kilometres in 2003. Despite this growth, the share of rail in total freight transport remained relatively stable at 4.6% in 2022. The expansion in rail freight transport can be attributed to recent investment and political measures, in addition to economic growth. The volume of international transport by rail has also seen a remarkable rise, increasing from 758 million ton-kilometres in 2003 to 2,006 million ton-kilometres in 2022. Container transport,

which aims to integrate with other modes of transport, has made consistent progress. The volume of container transport by rail has grown substantially, from 658 thousand tons in 2003 to 17.7 million tons in 2022.

Concluding Remarks

Turkey has made substantial strides in upgrading its railway infrastructure over the past two decades, with a focus on bolstering domestic rail transport and connecting with international corridors. Although there have been promising advancements in passenger and freight rail transport on domestic and international routes, it is challenging to say that this represents a significant shift from road to rail. The government has expressed its intention to achieve a modal shift, as outlined in its national policy documents. However, achieving this aim requires significant investment, which is challenging to secure due to Turkey's financial constraints. Therefore, Turkey must explore alternative financing options, such as affordable international financing sources. In summary, Turkey aims to enhance its domestic rail transport and become a crucial hub between East and West. However, acquiring adequate funding is likely to be the primary challenge.

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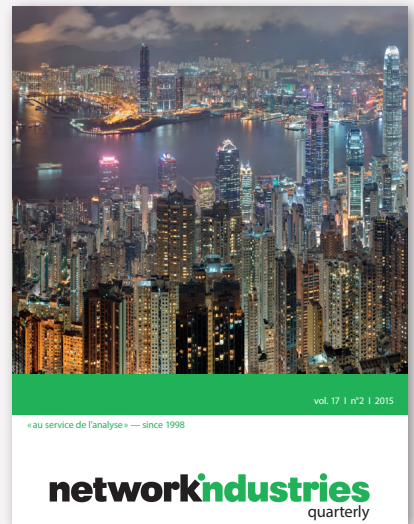
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Natalia Gortazar Managing Editor:
nataliagortazar@gmail.com
Ozan Barış Süt, Designer:
ozanbarissut@gmail.com



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