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The Logistics Conjuncture of the Middle Corridor Trade Route and Turkey's Strategic Role

Ali Atilla Arisoy[1], Ilgin Gokasar[1,*]

[1] Department of Civil Engineering, Faculty of Engineering, Bogazici University, Istanbul, Turkiye

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ABSTRACT

The Middle Corridor (MC) is a very important multimodal trade route that connects the People's Republic of China (PRC) to the European Union (EU). Functioning as a bridge by linking Europe with Central Asia and the Middle East, Türkiye has a special role along this route. Recent increase in the geopolitical tension such as the conflicts between Russia and Ukraine, and Israel and Palestine caused a significant increase in demand for the MC. However, this spike in demand has also exposed the route's technical and operational weaknesses. Lack of coordination between neighbouring countries and the delays encountered during transitions between railway and road networks are some of the most important issues that need to be resolved. This study examines Türkiye's role in enhancing the MC's efficiency. Key infrastructural investments, such as new railroad projects and the integration of electric trucks for last-mile transshipment, are analysed in terms of their potential to improve the environmental performance and the level of sustainability of the MC. It is emphasized that the coordination between countries should not be limited to cross-border coordination. Conducting infrastructural projects in a joint manner and exchanging expertise among MC countries are expected to benefit both the MC's performance and the development of these countries. Despite the high potential of MC, due to the limitations of this route, the logistics sector professionals tend to avoid this route. With this study MC's key challenges and solutions to these issues are presented. These solutions aim to increase the MC's reliability and economic viability.

1. Introduction

The Middle Corridor (MC) is a multimodal trade route that connects the People's Republic of China (PRC) and European Union (EU) (Figure 1) [1]. Considering the recent geopolitical events, such as the Russia-Ukraine and Israel-Palestine conflicts, it can be said that there is a significant demand potential on this route. MC is a very important opportunity for PRC to access the international market in a very efficient manner [2]. PRC is working on multiple investments for improving the level of service and connectivity by coordinating with different countries along this corridor [3].

* *Corresponding author.*
E-mail address: ilgin.gokasar@bogazici.edu.tr

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Turkmenistan, Uzbekistan and Iran are some of the countries that PRC wants to include in the MC. With the Kamchiq Tunnel in Uzbekistan the level of connectivity between PRC and Middle Asia has improved significantly [4]. A railroad project between PRC and Afghanistan has been signed in 2016 which allows transporting goods between PRC and Iran in half the time of a maritime freight trip departing from the Port of Shanghai [3]. Many individual sections of the MC are operational up to a certain capacity. However, when evaluating the end-to-end MC logistics operations technical and operational problems are realized. In order to improve the capacity and performance of this route, proper transportation infrastructure investments and coordination efforts between the countries along the route is essential [5].

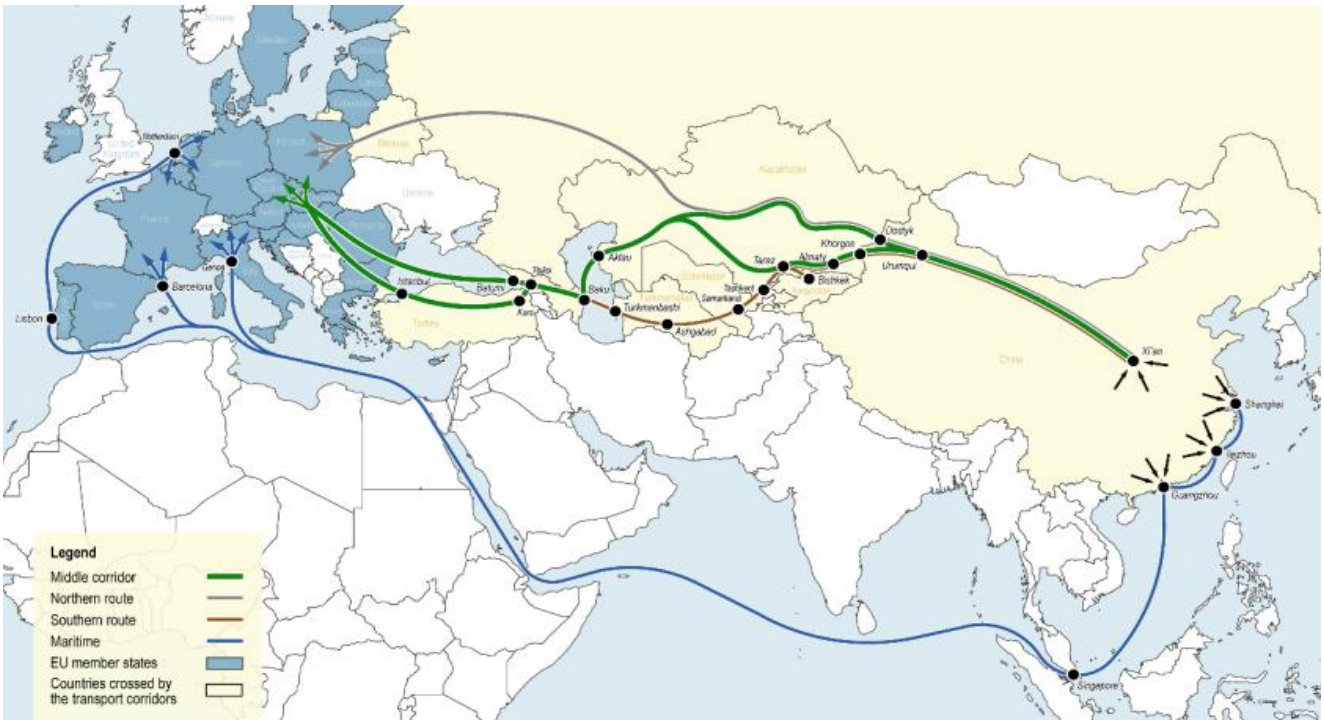

Fig. 1. Map of the Middle Corridor [1]

Lack of coordination between neighboring countries for border-crossing operations, the high frequency of border crossing along the route and operational issues caused the logistics sector professionals to experience significant delays. These issues of this trade route have become more apparent with the significant demand increase due to the Russia-Ukraine conflict. The container traffic on MC has increased by 33% in 2022 with respect to 2021. Due to delays encountered by logistics experts, they quickly have redirected their operations away from this route. As a result, container traffic decreased by 37% in the 8 months of 2023 compared to the same period in 2022 [1]. The difficulties in the coordination between neighboring countries is one of the key weaknesses that cause doubts about the MC's potential [6]. According to research Georgia, Kazakhstan and Azerbaijan have a significant role in this route [7]. Delays on this part of the MC due to poor road and port transshipment at the Caspian Sea and, low shipping capacity between Aktau-Baku route and railway infrastructure gaps at the borders are important issues that need to be resolved with joint efforts. Additionally, with the utilization of recent technology the traceability of the cargo and the predictability of costs must be improved. By improving the railroad infrastructure, the trade route can achieve the necessary reliability.

With proper railroad system investments, the cargo deliveries can be made in a timely manner and easily tracked throughout their trip. Intercontinental railway projects can improve the levels of

efficiency in terms of both cost and sustainability [8]. According to research the current state of the railroad infrastructure in the MC route is very problematic. High costs, unpredictable schedules, inadequate cargo tracking systems, train-truck transshipment challenges, last mile delivery issues and the low-quality logistics centers and railway vehicles are the relevant key issues to the railroad infrastructure of MC [1]. Because of these issues the logistics specialists prefer to utilize marine transport for the delivery operations over Georgia-Türkiye-EU. These freight ships are traveling parallel to the Northern coasts of Türkiye which is not ideal. According to the EU's Green Deal, it is determined that logistics operations over 350 km is preferable compared to other transportation modes when considering the efficiency and sustainability aspect [9]. Therefore, by improving the railroad infrastructure of Türkiye, a significant step towards achieving the sustainability goals set in the Green Deal can be taken. As the final section of this route going through Türkiye it is also important to consider the last mile delivery operations using either fossil fueled or electric vehicles (EV). If not, the full potential of the benefits, such as delivery time improvements and reliable transport operations, provided by the railroad systems cannot be fully realized.

PRC has made significant investments towards developing electric trucks (ET) to be used in many different areas. Additionally, studies show that by allowing the logistics companies to issue for allowances will quicken the electrification of logistics fleets. By doing so significant environmental benefits are expected [10]. Studies that focus on the feasibility of electrified fleets for last-mile deliveries are available in the literature [11]. With proper incentives and financing, it is possible to justify the initial cost within the first 5 years. In addition to environmental benefits, in order to obtain high efficiency last-mile delivery operations collaboration between the logistics parties is essential [12]. The importance of collaboration is emphasized at every step of the MC.

This study focused on the significance of this route for Türkiye's railroad systems. Key issues, particularly concerning the impact of the global adoption of EVs on last-mile delivery and challenges within railroad transport are inspected. Based on these findings, a discussion on the potential policy implications is presented.

2. The Role of Turkiye for the New Middle Corridor Trade Route

In 2021 and 2022 due to the conflict between Russia and Ukraine, the utilization of Northern Trade Route (NC) has shifted towards the MC. The increased number of vehicles passing through the custom gates of Türkiye's borders and freight trains arriving to the Logistics Center at Kars are indicators of this shift [13]. Additionally, the conflict between Israel and Palestine caused further instability in the Middle East region, consequently degrading the connectivity between Asia and Europe. Studies show that MC should be considered as a crucial route alternative in order to restore the level of connectivity between these two important continents [14]. Türkiye is the final country on this route that provides a direct land connection to the continent of Europe and has a very special geographical position. It is located on the center of Northern and Southern routes and connecting the east and western civilizations [15].

The current operational capacity of MC is equal to only 10% of the capacity of NC [16]. Türkiye's railroad infrastructure is capable of satisfying only a portion of this capacity with its railroad infrastructure. Due to the fact that there is an expectation of increased demand for the MC, Türkiye needs to act quickly to make the necessary investments for improving its railroad systems. In the Marmara zone, the Bosporus of Istanbul can be crossed via railroad using the Marmaray system. Additionally, in the Northern regions of Istanbul, a railroad project is being constructed that will cross the Bosporus over the Yavuz Sultan Selim Bridge which is expected to be completed in 2028 [17]. These two infrastructure projects are crucial for utilizing the railroad in an uninterrupted manner between Asian and European side of Istanbul. For the last section before reaching the borders of EU

the railroad project between Halkalı and Kapıkule is also being built and it is expected to be finished in 2028 as well [18].

In the Eastern regions of Türkiye, the connectivity to Georgia is obtained through the Baku-Tbilisi-Kars railroad project which has been completed in 2017. With this railroad project Türkiye has obtained an important spot between the Beijing-London train route. The next step to significantly increase the railroad capacity is to complete the project that will connect Kars to Edirne, which is the border city that connects Türkiye to EU [19, 20]. Even though the protocol for this project has been signed in 2011, the progress has been slow and it is one of the reasons why the logistics experts prefer to use the seaway route. With the completion of this project a major step towards connecting Asia and Europe will be taken which will also benefit all of the countries that MC is passing through.

The importance of MC for the countries that this trade route passes through is a huge opportunity for these countries. Türkiye is one of these countries that will significantly benefit from MC. An increase of 1% in GDP per capita in the MC member countries is expected to increase the exports of Türkiye to these countries by 0.92%. Additionally, it is estimated that the MC countries conduct around 80% more trade with Türkiye compared to non-MC-member countries. Türkiye's geographical position, cultural, religion and linguistic similarities are can be mentioned as the reasons of this preference [21]. Especially due to the fact that there is a significant lack of coordination between the neighboring MC member countries, Türkiye can act as a leader for satisfying this need [22]. By developing innovative management approaches for border crossing coordination and completing these major railroad projects, such as Kars-Edirne railway project, Türkiye can solidify its position as the most critical country on this route

3. The Role of Electric Vehicles in the Logistics Context

EVs have a significant potential in terms of environmental friendliness. After focusing on electric passenger cars, researchers are focusing on the developments of ETs. It is expected that by electrifying these heavy-duty ETs billions of dollars of health and environmental benefits can be obtained [23]. Cost analysis studies also show that the truck fleet electrification investment can be recovered within a feasible period [11]. Even though the initial cost for electrification is high, the total cost of ownership between FFTs and ETs is insignificant and can easily be covered with government incentives [24]. However, there are significant challenges for the transition from fossil fueled trucks (FFT) to ETs. Range is one of the most important one of these challenges.

Because of the much more limited range of ETs, compared to FFTs the truck drivers and logistics fleet manager tend to avoid utilizing ETs for their long-distance transportation operations. Charge duration is another factor that is considered by the logistics experts [25]. For lighter trucks which can be utilized for short distance transportation, the electrification process can be much easier. However, for long distance heavy trucks fast charging and availability of frequent charging stations are essential if ETs are going to replace FFTs [26]. According to these factors, it is adequate to use lighter ETs for last-mile logistics compared to long-distance heavy-duty ETs [27]. However, availability of ETs and their steady production is another factor that must be considered. During the COVID-19 pandemic the impact of chip shortage has been significant [28]. Therefore, it is important to have a reliable supply chain for ETs and its' spare parts.

PRC has one of the largest markets for ETs [29]. A significant portion of the crucial materials for the production of EVs and their batteries are mined in in this region as well [30]. Additionally, PRC is the primary manufacturer of a wide range of battery models for light and heavy-duty ETs and EVs. All of these factors indicate that PRC can improve the capacity of the MC route by incentivizing the countries along the MC to utilize ETs for last-mile trips to carry the cargo to and from the main

railroad network. With this approach it is possible to reduce the CO2 emissions and avoid potential costs, such as emission taxes that EU is expected to introduce.

3. Policy Implications

According to the current conjecture MC's performance depends mostly on the cooperation of the countries that this route is passing through. Strengths of the countries must be benefitted from, such as PRC's capacity of ETs production and supply chain. PRC's economic capacity can also influence the countries along the route by completing infrastructural projects in a collaborative manner. The Kars-Edirne railroad project is an example for this collaboration which is a joint effort between Türkiye and PRC [18]. With the current state of Türkiye, completing this project alone would take a very long time. However, with the joint effort it can be expected to finish this railroad route much faster. PRC should also collaborate with countries along the MC route by sharing its expertise in ET production to improve the efficiency of this route. This mutual cooperation will enable PRC to deliver their products to the EU market in a more efficient and sustainable way. Economy of the developing countries on MC route will also benefit from the improvements.

It is expected that even in the year 2040, 50% of the vehicles sold will be fossil fuel type [31]. Currently, 85% of EVs are sold in the EU and the PRC. As PRC being one of the largest EV manufacturer and EU trying to become the carbon neutral by electrifying its vehicles in traffic, the supply chain between them must also be decarbonized as well [32]. The necessary infrastructure for the EVs, such as the charging stations, are easier to operate and maintain near urban areas and more challenging in rural and rough geographical regions. Therefore, by building the train stations near urban areas or production facilities (i.e. industrial zones) be an incentive for utilizing ETs for last-mile logistics operations. The high initial cost for building the ET infrastructure, which can be considered a significant financial load on the developing countries, must also be handled in a coordinated manner.

The economic strength of the EU and the robust and technological production capacity of PRC, especially in the ET domain, must merge in order to maximize the benefits and potential of this route. As long as the geopolitical tensions in the northern regions and Middle East area the delays on this route will continue to persist without these infrastructural improvements and collaborative efforts. In Table 1, the advantages and disadvantages of different aspects from the perspective of Türkiye is presented. To summarize, in terms of distance, trip duration, sanctions and compliance issues, development opportunities, electric vehicle technology, and cultural factors Türkiye has a significant advantage. However, insufficient railroad infrastructure, poor port capacities, and high investment requirements are critical disadvantages.

Table 1
Advantages and disadvantages of different aspects from the perspective of Turkiye

Aspect	Advantages	Disadvantages
Distance	The MC is approximately 3000km shorter than the Northern Corridor.	-
Trip Duration	By moving the goods via railroads through Türkiye instead of Russia, it is expected that the duration of travel will decrease by eight days.	-
Sanctions and Compliance Issues	Due to the political tensions in the Northern Corridor region, the MC becomes much more preferable by operators that are looking for alternate trade routes.	-
Development Opportunities	With investments made on this route, the countries along this route have the opportunity to efficiently transport their goods to the EU zone (e.g. automotive goods, machinery, textile, raw materials).	-

Table 1
Continued

Aspect	Advantages	Disadvantages
Electric Vehicles	Türkiye's government is incentivizing electric trucks with tax exemptions and financial promotions. Global electric automotive cooperations (e.g. BYD, Tesla) are considering investment opportunities in Türkiye. Increasing the share of electric trucks is much more sustainable if these automotive investments are realized. Additionally, by switching to more environmentally friendly modes, the potential environmental taxes that can be implemented by the EU can be avoided.	-
Cultural Factors	The coordination between the countries along the MC route and Türkiye is expected to be much more efficient due to cultural, linguistic, and religion factors [21, 22].	-
Insufficient Railroad Infrastructure	-	Due to the insufficient railroad infrastructure sea routes that are parallel to the northern coast of Türkiye are preferred which decreases the efficiency and performance of the MC route [19, 20].
Poor Port Capacity	-	Due to low port capacity and operational inefficiencies, the seaway route in the Black Sea operates in a very low capacity. Additionally, unpredictable weather conditions cause significant delays which decreases the capacity even further.
High Investment Requirements	-	According to EBRD to rehabilitate the rail and road networks, enhancing the port capacities, improving the border crossing operations and the multimodal logistics centers, approximately 18.5 billion Euros is required. According to another study by the world bank, 7 billion dollars is required for short-term investments. Türkiye must develop their projects and allocate its resources for quickly completing their projects. Applying for these funds for funding these infrastructural projects is vital.

5. Conclusion

In this study, the current state of the Middle Corridor (MC), Türkiye's role within the MC and opportunities for improving the MC's performance via electric trucks (ETs) and railroad infrastructure improvements are investigated. The strategic importance of MC has become more due to the geopolitical conflicts between Russia-Ukraine and Israel-Palestine. Initially the logistics demand of other routes that go through these regions of conflict shifted to the MC as an alternative route. However, this sudden and significant increase of demand has exposed various operational and techical deficiencies of this route. These weaknesses resulted in significant delays in their operations

which caused this recently shifted demand to seek more reliable trade route alternatives immeddiately.

In order to maximize the performance of the MC the cooperation and efficient management between the neighboring countries, improving the railroad infrastructure and utilizing the expertise of ET domain of the People's Republic of China (PRC) and generalizing it to the counties along the MC route are essential. Türkiye's geographical position is very special due to it being acting as a bridge that connects the continents of Europe and Asia. The completion of railroad projects will provide significant benefits here. Especially with joint efforts of the PRC and Türkiye the projects can be completed in a quicker manner. On top of this, utilizing ETs for short-distance last-mile transshipment operations between road and rail transportation, can be beneficial in terms of environmental and sustainability aspects.

Main limitation of this study is that there is no direct calculation of the potential performance increase for the proposed solutions for the MC's infrastructure. The future studies are expected include the investigation of different management approaches' influence on the performance of the MC and the influence of different infrastructural investments over the MC.

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Conflicts of Interest
The authors declare no conflicts of interest.

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