

Review Article

# A Review of High Speed Railway Development Phases in Worldwide and Effects to Energy Policies in Turkey

Mehmet Çağrı Kızıltaş\* 

Engineering Department, Istanbul Ticaret University, Istanbul, Turkey

## Abstract

Transportation systems are discussed in the parallel to mass transport, intercity and intracity railways and marine lines. Especially in the metropolitan areas; they are vital and the main part of the problems and solutions. Modal integration and high balanced modal distribution are the key issues for metropolitan transportation solutions. These parameters are also result and check of a very wide area, they include social-economic-technic-cultural-politic distribution and integration of a city, metropolitan, region or a country. Railway transportation mode has a vital role on balanced modal distribution, intermodal integration, highway safety, sustainability, reducing highway traffic congestion and enhancing fuel savings. High speed railway is related with sustainability, innovation, environment friendship, alternative energy usage and well urban planning. High speed railway is a high capacity, high speed, high comfort and high technology railway transport mode. High speed railway is most improved inland transport mode with Maglev. High speed railway is very competitive on 400-800 km distance operations. In this paper firstly transportation policy effects on regional and city scale are expressed. Than transportation infrastructure bases, mentality and the position of high speed railway is evaluated in terms of them. After these development phases of high speed railway in Turkey are discussed. Finally, its results and future trends are shared for Turkey.

## Keywords

High Speed Railways, Transportation Policies, Transportation Investments, Passenger Transport

## 1. Introduction

Sectoral developments in the advanced economies, such as the European Community and its neighboring western (and also eastern) countries, rely on further mobility. The functioning of a complex society rests on face-to-face contacts. The decentralization of decision-making, the reduction of warehouse stocks, and the increasing specific value of transportation goods, all require an advanced (i.e. fast and flexible) transportation system. 2023 vision of Turkey contains this issues too and 10<sup>th</sup> development plan of Turkey gives a perspective about this vision.

It has been mentioned that obtaining ‘The Highway Traffic Safety’ has lots of components that are reducing suitable ratios of highway in modal contribution, having production-consumption axe in human focused approach and using intelligent transportation systems on true location and time decisions [1]. In this paper, not only highway traffic safety is discussed, but also railway safety is mentioned too. This issue contains railway platform, tracks safety and railway cross section safety.

Traffic safety issue is directly bonded with balanced modal distribution and intermodal integration, hence the

\*Corresponding author: [mckiziltas@ticaret.edu.tr](mailto:mckiziltas@ticaret.edu.tr) (Mehmet Çağrı Kızıltaş)

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transportation developments that were highly enhanced in Turkey in last years are having a constitutive position in this case. This issues also includes the necessity and suitability the investments in cableway systems, marine ways and railways too. All of these improvements will affect the existing traffic system, especially in Istanbul and in other big cities of Turkey. For instance, Istanbul has Bosphorus bridges, Marmaray, highly increased of urban railway lines. In this paper, existing case of transportation system in Istanbul is shortly mentioned.

## 2. Literature Review

As we look at the history of railways development in Turkey, we see that many significant investments have been done in the last periods of Ottoman Empire (important part of these investments are in Anatolia Land) and these investments have continued as accelerated up to the first twenty years in the Republic Period in Turkey. Nevertheless, railway investment orientation even stopped, as transportation system and service transformed to only highway transportation. In this duration, huge motorways and streets has been constructed. But as these investments were being realized, there were the reality that the interest in marine transportation and railway transportation decrease. And these politics have continued steady over decades until today in Turkey [1]. Although highway investments have continued marine transportation, railway transportation and inland waterway transportation are almost forgotten. At the same time, with the help of social politics, periodical relaxations and money exchanges, the possibilities and transformations of technology can be inserted to mentality of our people but because of the lack of perspective, construction by the view of social-economic-political-technical, all these developments stayed local (periodical, partial) and caused any other different losses.

When we review these losses by the view of technical-economical viewpoints, we see that the results were not manageable by consumption culture, the high fatality lose ratios, deep social injustice, low ability of using the sources effectively and efficiently, transforming of modal distribution to singular modal distribution have caused plan less urbanization.

Transportation links of a country are like the interactions of veins, capillaries and constituents of a body. In this meaning, well balanced and functional transportation system is also an argument and supply of healthy implementation of all social-cultural, geographic, technical, economical connections and distributions. Turkey that is surrounded by seas on three sides, has unique waterways 'Marmara Sea' and 'Straits', located in the middle of Blacksea-Caspiansea-Mediterranean Sea, culminated on Van Lake, Lakes Region and any other feeding water lines, has used this potential very limitedly, up to today [2].

## 3. Materials and Methods

However, it is possible that to travel from Bulgaria-Romania to Netherlands (Arctic Ocean) by Inland Waterways due to uniting of Tuna River and Rehn River. Similar benefits are taken West-North Russia Geography. The true investments and interventions to Marines and Inland Water Lines have the potential of formatting ability of a geography's strategic location and also affect deeply the transportation capacity of peripheral areas.

In the recent past periods, in this method, with the construction of Panama Canal and Suez Canal, the progress of history-battles-economy-strategy could change deeply. With the support of enormous projects, brief approaches, human focused (not rent focused) point of views and the necessary technical equipment, the level of service parameters of countries, regions can be improved in high frequency. In this contrast, especially in Istanbul, we have to understand that urban transformation is a process and duration and also integration of historic local configuration-environment-postmodern structures [3].

According to all of these, we can make a fundamental transportation and urbanization plan and return the threats to opportunities in Istanbul. In General Turkey and especially in Istanbul, because of their variant topography, socio-cultural composition, economic distribution, geographic position and etc., multimodal approaches is a possibility and necessity.

Transportation has given a very significant contribution to development of communities and has been an impulse for technological improvements. In parallel to increasing of transportation capabilities, intergonial communication and interaction have been strengthened that presented very important supports to human civilization. Nowadays transportation is one of the pioneering service sector that has a double faced relation to the parameters of economical, technical, social, cultural and political developments.

The technical improvements in the 20th century has revealed a wide range of usage and necessity area for each transportation modes. In the 21st century this period has enforced an effective and efficient usage of all transportation modes and maximization of intermodal integration [4].

Because of the close and mutual relation of economy and the transportation system, the economic developments that have scale as local, regional and global causes permanent changes and decision makings on the transportation system. The last 40-year period improvements in the world forced more balanced and environmental economic perception. Hence there are directly reflections of this approach to transportation. USA, EU, Japan and such as similar countries realized the importance of balanced modal distribution and intermodal integration on earlier periods and designed their politics in this context. The White Paper which was accepted in September 2001 by the European Commission get some decisions that are extension of transportation networks to the continental area, providing connections of these networks to

neighbor geographies, developing more effective politics for freight transport, modal integration of high speed railways and acceleration of high speed railway investments on the contrast of local, regional and international integration.

## 4. Results

TINA Report, which was presented in 2007 by the EU aims to providing sustainable mobility, managing the transportation network that lies on an expanding EU map and establishing the multimodal, integrated transportation system. So TINA is an entrance report for the free circulation of people, freight and services. Another special aim of this report is integration of Turkey's transportation system, networks to EU and presenting a projection in this context.

EU produces multimodal alternative solutions on transportation like TRACECA. In the scope of this project, the main issue is the revision and rehabilitation of transportation networks such an extensive geography from Middle Asia to Europe. TRACECA is a Black sea, Caspian Sea focused project that targets the integration of East Europe to the Mediterranean Sea. Turkey is the center of TRACECA geographically, because of this Turkey's high speed railway projects are not independent from others [4].

Additionally, a strong emphasis should be placed on the integrative effects of HSR, especially with respect to economies of scale and scope that they exploit, but also stimulate; the latter, however, this necessitates the inclusion of feeder systems and other modes into consideration. We have stressed the importance of properly accounting for the political environment, with respect to a rivalry among regions and the competition in transportation. This implies that poli-

cy-adaptive strategies must try to structure the resulting problems, once the planning of a HSR system has started. The fifty years' perspectives of European Union for the politics of transportation gives priority to High Speed Railways. Both passenger and freight transport modal ratio aims are projects to HSR, very significant role for the EU transportation.

Moreover, Turkey has a strategic position on the new railway network approaches on the contrast of revision of historical silk road. In this parallel; our country constructed Marmaray, which has a vital function on Asia-Europa, Beijing-London and other related corridors. Marmaray is not only a system that connects the two sides of the Bosphorus, but also a special project that connects the high speed railway links, which are important parts of intercontinental links, besides being part of Istanbul's mass transport modes transfer center.

EU represents TER (Trans European Railway Network) as a part of TEN (Trans European Network) that consists projections for high speed railways. The priority of nineteen Project for railway is PBKAL that connected to TER. PBKAL is a high speed railway project, which connects Paris (France), Brussels (Belgium), Cologne (Germany), Amsterdam (Holland) and London (England). Amsterdam step of this line connects to London by Manche Tunnel. PBKAL is a very important part of definite Europe High Speed Network that serves 200-300 km/hour. In long terms, it is accepted the attention of Turkey to this link by Wien (Austria)-Budapest (Hungary)-Belgrade (Serbia)-Sofia (Bulgaria). On the 2015 projections of EU, it has planned to have 30000 km railway network that contains 19000 km up to 250 km/hour speeded. Table 1 shows operational properties of high speed railway lines in European and in Asia Pacific region countries.

**Table 1.** Comparative High Speed Railway Lines and Design Speeds [5].

Country	Lines On The Service	Design Speed (km/hour)	Line Numbers At The Maximum Speed	Maximum Design Speed (km/hour)
France	10	251-272	3	272
Japan	9	225-256	2	256
Taiwan	77	207-245	1	245
Belgium-France	55	229-236	1	236
Spain	29	202-236	2	236
China	119	202-236	107	236
Germany	39	200-226	15	226
Britany-France	24	213-219	10	219
Britany-Belgium	1	201	1	201
South Korea	2	200	2	200

As far as the "Common Transport Policy" (CTP) of the European Community is concerned, the railway systems of 12 different European countries show a wide range of operational, financial, and investment circumstances, highlighting some of the CTP's problems. The CTP has failed to appreciate the importance of railways as a means of moving freight and people, and furthermore, has failed to support member states, who were and are struggling with financial problems. In this context, railway investments have been realized that has higher degree service parameters and infrastructure standards for 40 years on the leadership of Japan, France and Germany. In the last decade, Spain and China has entered to this sector with a very high acceleration and has become the leader with Japan and France on high speed railway mode. High speed railways are more competitive to airlines on middle-long distances that are ideal on intercity travels on same locality for one day travels. High speed railway (HSR) is very significant pioneer for local, regional and national integration and safety transportation mode for economical advances. High speed railway is considered to be a strongly politically favorable by the general public in Turkey. HSR obtains an economic value is based on service parameters. These service parameters are based on social aspects [6].

## 5. Discussion

The HSR sector that is on the leadership position in Japan, France, Spain and China and also is showing a rising market sector in Germany, Italy, Turkey, Britain, Switzerland, Russia and South Korea. Although Turkey has an effective entrance in this sector, still lagging issues that establishing national sectoral industry and installing sufficient infrastructure [7]. In addition, HSR has some any other advantages that are being an environmental friendly transportation mode, occupying less place, operating high capacities and being very closer to alternative energy usage through electric energy source. Specially, alternative energy issue has an increasing importance globally and that is a strategic issue for Turkey and in our region [8].

Turkey has an important entrance to the sector and in this context, firstly Ankara-Eskişehir high speed railway (HSR) stage of Ankara-Istanbul high speed railway link opened for operation. After these, Ankara-Konya HSR opened to operation speedily, because of its suitable topography. Moreover, Erzincan stage of Ankara-Yozgat-Sivas-Erzincan HSR began to be constructed in 2013. This line is planned to be extended from Erzincan to Erzurum and Kars. Also Konya-Eskişehir HSR began to operation in 2013. Nevertheless, Eskişehir-Istanbul stage of Ankara-Istanbul HSR is on construction [9]. Likewise, Adana-Mersin connection from Konya and Ankara-Izmir HSR Projection are continuing.

Turkey's HSR politics includes economical and regional development, realizing the intersection position, supplying effective energy efficiency, managing the consumption culture and rehabilitation of traffic safety [10].

It is going to be given a wide assessment of experienced countries and new countries that are leaders on the sector. Moreover, it is to be represented by infrastructure standards, network extension periods, international railway connections, intermodal integrations, service parameters and similar conditions in all sectoral countries in a detailed comparative review. This is going to be give a projection to Turkey with a comparison. On this contrast, the comparisons result outputs on the scale of global, regional and national that sets off a general estimation [11].

## 6. Conclusions

Strengthening 'the governance mechanism with public' with a politic that can read the background of technical, economical and social developments, that can solve the problems, canalize the people to the 'true consumption practices' and transform the transportation system to a completely service system by making our cities more livable, increase our life standards in the right direction [12].

Thus sustainability notion becomes prominent. At the beginning of 20th century, this notion has been kept in literature by Institutive Staffs of Turkish Republic. This was a long-sightedness instance. In the recent periods, sustainability was issued by the Western Countries that have experienced major technical developments in the last 30-40 years before from Turkey. The reflections of sustainability to transportation system are increasing gasoline variety, improving renewable energy possibilities, inserting alternate transportation modes, intermodal integration etc. [13].

In a special note for our country, it can be read that extension of subways in mass transport, supplying active and integrated marine transportation (producing demand and satisfying), inserting cableway systems, popularization of bicycle usage, extension and standardization of bicycle ways, canalizing the car ownership to the healthy degrees and levels by education-awareness methods and realizing enormous investments by brief steps are useful and should be focused [14].

All these approaches are completely with the '2023 Vision' and the politics of the government that targets the biggest economy on the large area which is surrounded by Paris-Berlin-London-Moscow-Beijing-New Delhi transport system. Indeed, Istanbul is the naturel capital as the mean of social-economical-cultural-geographical-political of all of this large geography. Living in Istanbul and being a part of Istanbul make us the object of all these responsibilities, benefits, costs, risks and opportunities. Higher level of life can be realized with the integrated point of view, 'human focused approaches', long term politics, the idea of improving own perspective and a sustainable perception [15]. As a result, it has seen that the key issues in transportation system are modal integration and intermodal distribution. These are keys for traffic safety, support to quality of life, less traffic congestion and acquisition by monetary-non monetary time. Thus keys



have ‘political-technical-economical-cultural’ backgrounds. So it also includes ‘mind and design’ integration. Mind and design integration relates to sustainability notion and sustainable development concept. All of these conceptions are a whole body and ‘transportation-urbanization and architecture’ is main frame of this body. Transportation has a direct interaction with socialization.

## Abbreviations

HSR	High Speed Railway
EU	European Union
USA	United States of America
TINA	Transport Infrastructure Needs Assessment
TRACECA	Transport Corridor Europe Caucasus Asia
PBKAL	Paris Brussel Koln Amsterdam Luxemburg Line

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## Author Contributions

Mehmet Çağrı Kızıldaş is the sole author. The author read and approved the final manuscript.

## Conflicts of Interest

The author declares no conflicts of interest.

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## Biography



**Mehmet Çağrı Kızıldaş** is married and has one child. He has doctorate degree on civil engineering. His expertise area is transportation. His PHD thesis is about Autonomous Vehicle Traffic Characteristics and Traffic Behavior Analysis. His master degree is from Istanbul Technical University Civil Engineering Faculty Transportation Main Department with his thesis about High Speed Railways. He has written more than 100 academic papers and more than 20 books.

## Research Field

**Mehmet Çağrı Kızıldaş:** autonomous vehicle, high speed railways, clustering analysis, planning, Urban