New Pursuits on Public Transport Policies for Middle-sized Cities in Turkey: Erzincan as an Example Specific to Rail Systems

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Abstract

Urbanization, which has been one of the most significant parameters of changing social structure since the beginning of 20th Century, has also brought urban transport problems. To cope with these transport problems, traditional vehicle priority policies must be abandoned; modern policies taking individual mobility into consideration must be considered. To increase that mobility, urban rail system projects, which have long been implemented in developed countries, have become widespread in Turkey. These projects that have become the main transport system in many Metropolitan Municipalities have recently begun to be implemented in middle-sized cities. This study reveals the developing role of rail systems in transport policies as a tool for social and economic development and explores traffic policy in Erzincan as an example for middle-sized cities in Turkey.

1. Introduction

Since the transition from conventional agricultural society to modern industrial society, technological improvements have developed transport systems, and these systems have increased social and economic mobility as one of the determinant factors in social development.

Social development theories reveal that social development depends on economic, social, and cultural revival, namely on mobility. These theories insist that development and improvement increase along with the increase in social mobility [1]. Transport technologies, as one of the most significant elements in development of economic, social, and cultural mobility, undertake critical functions such as productive use of natural resources, distribution of goods and services, and development of internal and external trade [2]. Urban transport systems are necessities to help the occurrence of social and cultural activities, along with interpersonal and social relations [1].

Transport needs, which in primitive societies were accomplished by walking and simple wheeled vehicles, since the beginning of 19th Century have gained another dimension with the development of faster and higher capacity transport vehicles using steam, electricity, and internal combustion. These technological pursuits, focusing on development of transport systems, caused rapid increase in individual automobile ownership and the number of motorized vehicles. To respond to the intensive infrastructure demand that followed this increase, some policies dependent on petrol and its derivatives followed between the 1950s and 1970s: removal of public transport vehicles from transport systems, annihilating urban rail systems —primarily trams—and extending road networks. In this period, traditional policies did not respond to the increase in the number of motorized vehicles; on the contrary, these policies contributed more and more to the complexity of existing problem.

Although traditional policies as responses to solve traffic congestion problems present short-term solutions, they increase the number of vehicles and trigger a new loop in which similar problems are continued to occur (Fig. 1) [3].

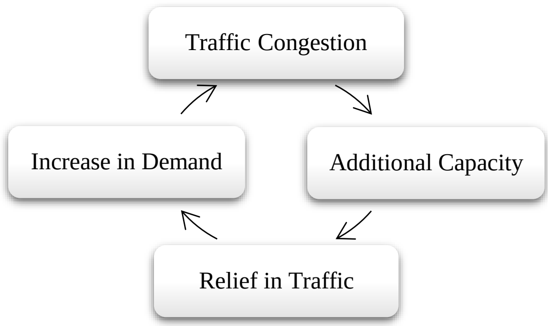

Figure 1. General Approach of Transport Systems

Increasing traffic congestion in urban transport since the 1970s and the economic effects of the global petrol crisis have made elimination of traditional vehicle priority approaches and implementation of contemporary human scale transport policies focusing on public transport inevitable [4]. Human-scale contemporary transport policies have been developed through strategies on establishment of safe public transport services, implementations that encourage private car owners to use public transport and discourage them from using their cars. Within the framework of these strategies, development of high capacity and integrated public transport systems, particularly rail systems, come into focus [3].

Urban public transport systems, set up for use of individuals, have an established tariff of fares, a route, timetable, stations, and on-line integrated rubber-wheeled or rail vehicle systems. Rubber-wheeled transport services are used on the routes that have lower passenger demand; rail systems are used on higher trip demand routes. Between these systems, light rail system (LRT), metro, suburban train, magnetic bearing, and monorail implementations have become prominent [5].

In the present research, the developing position of rail systems among public transport policies, development processes of rail systems in terms of legislation and implementation suited to Turkey, and implementation stages using Erzincan as an example as a middle-sized city will be explained.

2. Rail Systems in Public Transport Policies

Traditional transport policies that focus on increasing mobility of motorized vehicles that use fossil fuels have not been primarily preferable transport policies in the countries that are within the sphere of influence of European Union. Urban traffic intensity caused by low capacity and private vehicle transport, traffic congestion, air and noise pollution, as well as time and energy loss render this approach unsustainable. When modern approaches emphasizing human mobility rather than vehicles are investigated, public transport systems, particularly rail system implementations in coordination and integration with other systems, are the core of these policies. [1]. This section, which aims to give information about rail systems used in public transport policies, focuses on the topics such as first rail system implementation, historical development of these systems, and compares different rail system implementations.

The first rail systems were seen at the beginning of 19th Century: trams being moved on a line through horsepower. These implementations, seen in New York, New Orleans, Paris, London, Copenhagen and others, offered improvement of some parameters such as speed, size, and distance covered, together with the integration of electric motor technology into these systems since the beginning of the same century; these implementations constituted the backbone of public transport systems [6]. The first metro implementation in which electric systems were first being used was London metro (1863). Apart from London, short-distance implementations appeared around these dates in some cities like Budapest, Paris, and Istanbul [7]. After the first half of 20th Century, because these systems did solve the problems of traffic and infrastructure in relation to an increasing number of the number of vehicles, rail systems represented the main alternatives for transport policies that focused more on public transport systems. In this policy framework, underground metro system networks in city centers and suburban train lines at the outer parts of cities integrated with these metro lines were constructed. Through these public transport policies, in which an accessibility concept was taken into consideration, the target was to decrease the use of private car and to increase quality of life in cities [8]. When global scale examples of rail systems are investigated, the prominent examples are heavily populated greater cities like Shanghai, New York, Chicago, Paris, Moscow and London with their long and frequently used metro lines.

The first rail system implementation that integrated fossil fuel with motorized public transport services were tram and metro services in city centers and suburban train [9]. Recently, research into urban rail public transport systems and technological innovations have been changing the concepts behind rail systems and have generated new systems having more flexible activity areas; they defined by concepts as rapid-tram, light-metro or half-metro. These new systems will be defined light rail systems during the present research [10].

Suburban train systems, developed to transfer people to who are obliged to live at the outside of city centers city by the increasing population in modern cities and intensification of shopping and working activities in city centers, are one of the most significant alternatives with their high passenger capacity and transportation cost. This system, which can be used integrated with an inter-city railway system, is quite efficient in terms of energy consumption and operation costs; it is also safe and comfortable [9, 11]. Suburban train implementations are 1435-mm line-width systems fed by 15 to 25 kV line voltage via a catenary [12].

Urban rail public transport systems having the lowest passenger capacity system is the tram. This system, which moves on rails laid at the same level as the highway, is called a "street tram"; it can be operated in a mixed way with traffic and as a grade crossing, depending the topography [5]. These systems, which are usually driven by a driver, are dependent on road and traffic conditions: they are operated at 25–35 km/h, low operating speeds compared to other rail systems because they are intermixed with traffic, and because the distance between stops is short [6]. Tram systems are technically restricted to 1 to 3 carriages with 1435 mm track width; vehicle widths between 22002650 mm; catenary systems with a power supply density of 750/1500 VDC; maximum speeds of 60–70 km/h, average speeds of 2535 km/h; maximum passenger carrying capacity in one hour with 300–500 m distance between stations, 100–300 passengers; 4-6 axles with lengths 14–21 m; range from 7000 persons per hour up to 15,000 passengers by increasing speed, unit vehicle capacities ,and frequencies [9, 11]. Tram systems can be considered as the main transport system in the settlement units with lower population because of the maximum passenger carrying capacity, but they can also be used as an auxiliary transportation system integrated with LRT or metro systems in cities with high travel demand and high population [5]. In addition, if the tram system can be better organized and integrated with other urban transport systems, it can operate efficiently at lower capacities.

A transitional form between tram and metro systems, Light Rail Systems (LRT), has been used in many mainly European developed countries since the mid-1970s, can carry a maximum of 35,000 passengers in a single direction with less passenger capacity than subway. These systems, which are designated as fast trams, light metro, or pre-metro, are controlled by a driver on the main roads mostly supported by the open-closed tunnels, splitting, diving, viaducts, and special short tunnel techniques; they rarely by the signalization system [6, 11]. These systems, which are used intensively in railway public transportation, are often preferred because they are more flexible: they are adaptable to urban macro forms, can be operated in mixed traffic, have lower cost compared to metro systems, have the opportunity to make a flexible selection of the physical properties of the vehicles depending on the applications, have superior energy-saving and lower air pollution caused by petroleum-fueled vehicles, have a lower accident risk, and are more comfortable [6]. Light rail systems have a 1435-mm track width, 2200–2650-mm vehicle width, 750/1500 VDC supply voltage via catenary or third track systems, maximum 60–100 km speed, average 25–45 km operating speed, 2–7 bellows, capable of carrying an average of 250–300 passengers in single or multiple arrays with 4–10 axles, are 18- to 42-m in length, have a designed 600–1000m distance between stations, and a maximum passenger-carrying capacity of 35,000 passengers per direction in one hour [5, 12].

Metro systems, which constitute the main axis of public transport systems in greater cities with intense travel demands, can carry many more passengers with better comfort and safety compared to tram and light rail systems. Compared to other systems, initial investment and operation costs are higher; however, their ability to manage intensive travel demands easily using advanced signaling systems on private lines come into prominence. These systems are usually constructed underground to alleviate the surface traffic burden; but in the case of suitable topography, options of either grade level or viaduct can be applied to reduce infrastructure costs [5]. Metro systems are heavy rail systems that have a 1435-mm rail width, 2650–3150 mm vehicle width, 750/1500 VDC supply voltage over catenary or third rail systems, maximum 80–100 km speed, an average operation speed of 45–60 km/h, carrying capacity average of 1200 to 2500 passengers, with 4-axes and up to 10 sets of multiple arrays, 180–200 m length, capable of traveling at an average of 20–40 hours per hour, and a maximum passenger-carrying capacity in one direction up to 100,000 passengers [6, 12]. Implementations commonly used in public transportation systems in urban areas can easily be compared using this information, see Table 1.

Table 1. Comparison of urban rail public transport implementations (İyinam and Öztürk, 2013: 3)

	Tram	LRT	Metro
Vehicle Capacity (passenger)	100–250	110–250	140–280
Vehicle Length (m)	14–35	14–54	15–23
Vehicle Width (m)	2.2–2.7	2.2–3.0	2.5–3.2
Number of Vehicle	1–3	1–4	1–10
Train Capacity (passenger / vehicle)	100–500	100–750	140–2400
Line Capacity (thousand passengers / h)	4–15	6–20	10–70
Maximum Speed (km / h)	60–70	60–100	80–100
Operating speed (km / h)	15–30	20–45	45–60
Emergency Brake Acceleration (m / sec^2)	2–3.7	2–3	1.1–2.1
Maximum Acceleration (m / sec^2)	1–1.9	1–1.7	1–1.4
Single Line Span (m)	3–3.35	3.4–3.6	3.7–4.3
Station Range (m)	300–500	500–1000	500–2000
Investment Cost (M $/km)	5–10	10–50	40–100
Percent of fully protected line	0–40	40–90	100

Urban rail systems as a significant component of modern public transport approach are preferred more as time passes, with their being comfortable and safer as well as their high passenger capacity and rapid transport time [5]. Together with the extended implementation of rail systems, technological improvements enable the development of many mixed rail and wheeled transport systems. In long-term public transport policies, which are formed by many factors such as existing population of cities, growth plans, and topography, it is required to find optimal solutions by integrating these new transport technologies.

Considering that rail system implementations in public transport policies have commonly been used in many developed and developing countries, it is significant to determine an eco-politic process that needs to be followed in development of rail system projects in Turkey. The upcoming section, in which this development process from legislation to implementation will be explained, investigates the development process of rail system implementations in Turkey in a general manner.

3. Rail Systems in Turkey from Legislation to Implementation

The first example of the use of rail systems in urban transport policies in Turkey is the Beyoğlu-Karaköy Tunnel: it began to operate in 1875 and is the world's third oldest metro. Subsequent urban rail systems were not included in transport policies until 1989, apart from several suburban railway examples from some Metropolitan Municipalities because of the Ottoman Empire decline, World Wars, and having taken rubber-wheeled transport policies preferred by political decision makers. Before the 21st Century, that rubber wheeled urban transport policies did not respond travel demand that had increased together with the increase in the population of larger cities made obvious the necessity to use rail systems in urban transport [13]. This section aims to answer some main issues as why to adopt rail system policies for urban transport in Turkey, which legislation to obey during implementation stage of these systems, the historical development of rail systems in Turkey and problems at the implementation stages.

Demographic change in Turkey, started in 1950s and experienced with significant part of rural population shift to cities, combined with irregular urbanization policies and generated important urban problems. One of the most important urban problem is the continuous increase in traffic intensification and transport problems. To cope with these problems, traditional motorized vehicle mobility-oriented transport policies have been abandoned, and rail systems have been moved to the core of urban transport policies, particularly in some heavily populated municipalities [14]. Rail systems in urban transport policies aim to resolve traffic congestion in city centers and on the main axes, to respond to travel demands of people at the outer parts of city centers, to eliminate existing deficiencies of public transport supply, to eliminate problems caused by intermediary public transport modes (like paratransit), to lower air pollution and noise levels, and to control urban settlement by supporting new development areas.

In Turkey, when the legislation on which rail system implementations depend is examined, the determinant role of development plans after 2000 can be observed. In the framework of related titles of 8th Five Year Development Plan prepared for the period 2000–2005, policies were proposed to increase traffic safety, increase the quality of public transport systems, develop pedestrian and bicycle transport, and for car parking management, taxi operation, and sea transport operation. In addition, the obligatory condition to implement a rail system is that the urban population under discussion needs to have at least one million people. The related titles of the 9th Five Year Development Plan, prepared for 2007 to 2013, put forth the policies of participatory, environmentally sensitive, and sustainable pedestrian and bicycle transport to overcome the problems caused by traffic. In the content of this plan, to have rail systems implemented, the travel demand of 15,000 persons per direction passenger/hour in peak hours is required rather than the population condition set in the previous plan. In the framework of the 10th Development Plan, covering the period 2014 to the present, pedestrian and bicycle lane implementation, integration of public transport systems, and smart transport systems have been given priority. It has been determined that minimum peak hour per direction travel demand in rail system investments is 7,000 for trams, 10,000 for light rail systems and 15,000 for metro systems [6]. However, it should not be ignored that lower capacity urban rail system preferences can also be created through an efficient feasibility, capacity, and volume calculation.

In cities that fulfill the conditions of development plans prior to investment, rather than considering rubber-wheeled and rail systems as alternative transport modes, these modes are as complementary modes. Following the year 2000, in some greater cities such as Istanbul, Ankara, Izmir, as well as Adana, Antalya, Bursa, Gaziantep, Kayseri, Konya, and Samsun that fulfilled necessary requirements in terms of population and travel demand, urban rail system projects were increasingly designed and implemented [5]. In the light of these developments, the total length of urban rail systems was 292 km in 2006, 477 in 2013, and it is expected to be 787 by 2018 [5]. Although the growth in rail system implementations demonstrates a significant transformation, considering the related statistics for Turkey and global scale in comparison, it is obvious that only the very first steps of this transformation have been taken [5].

Traffic problems in Turkey, environmental problems caused by fossil fuels, and related economic problems make it inevitable that urban rail public transport systems will become widespread, as in many other cities. In addition, in cases where funds are insufficient to cover the investment costs of these systems, public administration—particularly local governments— might be harmed economically.

Together with larger cities, to have rail system projects, which have commonly implementation potential in also middle-sized cities, economically sustainable, implementation processes and criteria should be approached carefully. In the framework of realistic constraints, rail system projects, which contribute development of cities in the long run, need to be designed. At this stage, implementation procedures of rail systems as tools for public transport policies will be explained specific to city of Erzincan.

4. Implementation Processes of Rail Systems in Urban Transport Policies and Erzincan Example

Increasing urban population and mobility that have resulted from rapid urbanization dynamics in Turkey affects greater cities as well as developing middle-sized cities in many aspects—primarily transport problems. The classification based on the size of the city includes many criteria such as population size, function, and general settlement level. These criteria, which define medium-sized cities, vary from country to country [15]. In this framework, medium-sized cities in Turkey are those with a population of 50.000 to 500.000 when the population size and urban function are taken into consideration based on the study done by the State Planning Organization in 1987 [16]. This definition is widely used today, with the upper and lower limit under discussion [17-18].

In transportation policies of medium-sized cities, traditional transport systems are abandoned and modern transport technologies are adopted in response to increasing travel demand with increasing of urban population [19]. To create a long-term solution to the transportation problems in medium-sized cities, it has been necessary to prepare a Transport Master Plan (TMP) for the municipalities by specifying legal regulations [20].

According to Article 10 of the Regulation, *"Metropolitan municipalities and municipalities outside the borders of the metropolitan municipalities, having a population of over one hundred thousand, prepare a Transport Master Plan. These plans are made for a period of fifteen years and are renewed every five years. City plans and sustainable urban transport plans are handled together."*[20]. The responsibility of preparing the main transport plan is among the obligations of the greater cities in the framework of the Metropolitan Municipality Act of 2004. The related article also obliges cities with a population of over one hundred thousand, in the framework of the Metropolitan Municipality Act of 2004, to prepare the main transport plan as part of the obligations of the greater cities [21].

In the development phase of transport policies of cities in Turkey, the preparation of a Transport Master Plan has an important place, based on the legislation. The Transport Master Plan (TMP) studies contain the collection and evaluation of available information, the calibration and validation of the transportation demand forecasting model, the target year projections, the identification of the problems and bottlenecks in the current and target year structure, the identification of alternatives and testing with the transport model, and the strategic planning and programming of Transport Master Plan proposals and projects. Completed transport plans are first examined by the Ministry of Transport, Maritime Affairs and Communications and the General Directorate of Infrastructure Investments. After this review, the Transport Coordination Center and Municipal Council in the Metropolitan Municipalities, and local governments that are not Metropolitan Municipalities, are approved by the municipal council and are put into force [22].

In case the Transportation Master Plan recommends a railway system, metrobus, or cable system line within the scope of public transportation planning, to assess the applicability of these proposals and their financial and economic feasibility studies, preliminary / final projects and feasibility studies are prepared based on the design criteria published by the General Directorate of Infrastructure Investments of the Ministry of Transport, Maritime Affairs and Communications [22]. When the project as prepared and feasibility studies are approved by the ministry, the option of rail system is referred to Ministry of Development together with Council of Minister's Decision.

In cities with increasing population and growing transportation problems, the applicability of the proposed transportation projects is determined by the Transport Master Plan and additional studies on this plan. In this framework, Transport Master Plans are being produced in many cities, especially in greater cities, and applicable studies are becoming common [23]. In Turkey's medium-sized cities , the Transport Master Plan, which has become more and more widespread day by day, and the implementation processes of the projected rail system proposed by this plan will be explained using Erzincan as an example.

The Transport Master Plan study in Erzincan, which is in the foreground as one of the important cities of the region with its location, historical, and cultural richness and economic potential, started with the Mayor's authorization obtained from the Municipal Council in May 2016. After the protocol was signed between the municipality and Gazi University, the related work was carried out by the Urban Transportation Technology, Accessibility Implementation and Research Center (UTTAIC) within Gazi University; the completed plan was reviewed by the General Directorate of Infrastructure Investments of the Ministry of Transport, Maritime Affairs and Communications in April 2017 and rail system investment was found to be appropriate.

Within the scope of Transport Master Plan, 1260 household questionnaires for the 65 neighborhoods within the boundaries of Erzincan Municipality, there was traffic counting on 56 different sections considering the transport structure of the city; a get-on/get-off counting study on 11 bus lines of the municipality, pedestrian counting on 18 different roads and streets on which pedestrian flow and density is greatest; and pedestrian questionnaires on 21 different working areas [24].

Within the scope of the Transport Plan, moving in the direction of 2032 as target year to respond to the transportation demands of the developing city, scenarios have been developed in which the existing situation and probabilities are observed in short, medium, and long term. The initial scenario as the continuation of the present situation, rubber-wheeled public transport scenario, rail system development scenario, and rail system alternative scenarios are the different approaches that are put forth in the Transport Master Plan (TMP). The alternatives generated by TMP have the power to influence the basic dynamics of existing situation. Scenarios developed for the Erzincan TMP such as travel cost, investment cost, air pollution, noise pollution energy consumption, and access time have been subjected to multi-criteria evaluation, and the least costly scenario—the rail system development scenario—was chosen [25].

The rail system project, which is among the scenarios of Erzincan TMP, is the Street Tram, which has the potential to respond to current travel demand and those in the future. According to this scenario, the planned system evolves in two stages. The first stage is projected to construct in the period between 2017 and 2018 and to be opened to service by the end of 2019. After the beginning of the operation of the first stage, 22.5 km in length, the goal is to complete the infrastructure works of the second stage in 2026 to 2027 and to integrate it into the system. At the first stage, it is assumed that the 22.5 km part of the project will be constructed between 2017 and 2018, and the system is projected to start operation during 2019. The infrastructure works of the second stage are planned to be completed and opened between 2026 and 2027 (Fig. 2) [25].

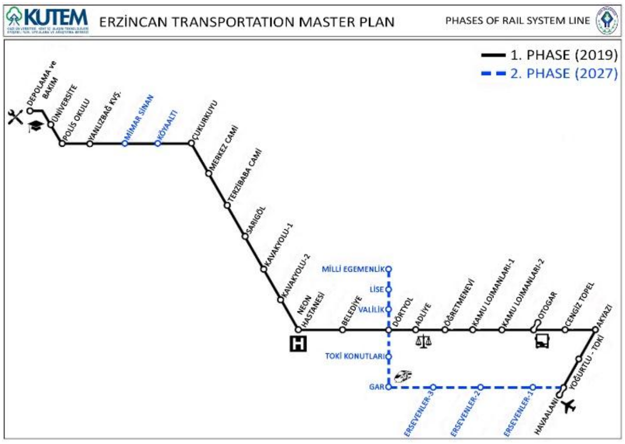

Figure 2. Erzincan Transportation Master Plan (TMP) Stages of Rail System Line

When the entire street tram line proposed for Erzincan city begins to operate in its circuit, 32 stops are planned to serve all the zones. These stops are positioned in a balanced manner in the regions where the commercial, educational, and residential areas of the city are concentrated, based on the city's Master Plan (Fig. 3). For the year 2019, the tram line is expected to carry 13,402 passengers in both directions and 7,860 passengers in a single direction during peak hours [26].

In the first stage, the length of the line is 22.5 km for 2019; it is planned that 109,170 passengers will travel at an average speed of 35 km / h per day. In 2027, the second stage of the project will be completed; and the total number of passengers after the construction of the 29.1 km line will reach 193.310 per day for 2027 [26]. Technical specifications such as speed, distance, travel time, rotation time, number of journeys, train capacity, peak one hour and maximum number of passengers, train number, train frequency, total capacity and number of required vehicles are presented in Table 2 by ten year intervals.

Within the scope of the project, a total of 14 vehicle purchases are foreseen in the first year, including 2 spare reserves in the first stage. To meet the increasing passenger capacity, the passenger projections are planned to supply 2 vehicles in 2022, 8 in 2027, 6 in 2032, 4 in 2037, and 26 in 2042 in [26]. The intervals at which the vehicles appear as recommended for the system are 5.5 minutes at peak hours and 10 minutes during the average daily general demand. Each set has a maximum capacity of 400 people. In bi-directional tram system proposed for the Erzincan tram line route, vehicle length is 40 m, vehicle width is 2.4 m, and vehicle height is projected to be 3.5 m [26].

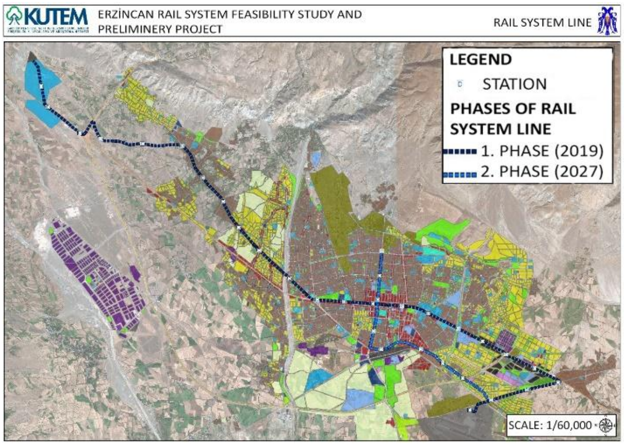

Figure 3. Erzincan Transportation Master Plan (TMP) Station Locations of Rail System

Table 2. General Characteristics of Rail System

	2019	2027	2037	2047
Speed (km / h)	35	35	35	35
Distance (km)	21	27.7	27.7	27.7
Duration (min)	36	47.5	47.5	47.5
Rotation Time (min)	79.7	105.6	105.6	105.6
Number of Trips	12	15	20	28
Array Capacity	400	400	400	400
Number of Passengers in Single Way at Peak Time (Passenger / Direction / Hour)	7.860	12.262	16.973	22.304
Peak Highest Cross-Section Value (Passenger / Direction / Time)	4.477	5.810	8.286	10.956
Number of Sequences	6	12	16	11 (22/2)
Expedition Frequency (min)	6	4	3	4,2
Total Capacity	4.4	6	8	11.2
Required Number of Vehicles	12 (+2)	22 (+2)	32 (+2)	42 (+2)

If the planned tram project is completed, the main revenue source will be the ticket sales to passengers. The expenditures of the tram during a given period consist of 3 items; investment costs of lines and fixed plants; investment expenditures for vehicles; and operating expenses. When similar projects are examined considering the slope, length and passenger density of the projects, the projected investment cost is 320,052,679 [26]. The project, which is planned to be financed by the state financing model, estimates that cash outflow can be recovered by 2022. The year in which the cumulative cash flow based on the repayment method are positive is the year 2024, which corresponds to the sixth year of the project [26].

The route planned in Erzincan TMP and the Erzincan Light Rail System Feasibility Study and Avant Projects approved by the General Directorate of Infrastructure Investments of the Ministry of Transport, Maritime Affairs and Communications combines all the terminal points (airport, high-speed railway, bus station) with the city center in the fastest and most convenient way. It facilitates the transition between different transportation types that operate intercity, and contributes a gain importance for the Erzincan region. Other advantages of the project include; convenience of topography and road widths on the route; low expropriation costs; and the potential for generating benefits beyond the cost of the project. In addition, the proposed rail system route connects Erzincan University, which is the main arrival/departure point of daily trips for more than 25.000 people, with the city center by fully satisfying their transportation and accessibility needs and contributes to the relationship between city and university.

5. Conclusion

To solve the problems in urban transport resulting from urbanization and the increasing population in our country, it is necessary to make rail system projects more wide-reaching. In this process, rail systems in the public transport policies of Middle-sized cities in Turkey has been investigated using Erzincan, a medium-sized city, where construction of rail system projects is enhanced by the population size stated in the "Regulation on Procedures and Principles for Increasing Energy Efficiency in Transportation" is provided for, and settlement order and number of passenger are conveniently obtained. In the medium-sized cities that are like Erzincan in terms of population (a population of more than one hundred thousand), rail system proposals should be developed that are directly proportional to urban development in the framework of sustainable transportation policies, and proper interventions should be made in public transportation policies for proper use of resources.

Acknowledgment

In this study, the data of the Erzincan Urban Transportation Master Plan Project carried out in May / November 2016 period is utilized.

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