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MEGARON 2019;14(4):555-566
DOI: 10.14744/MEGARON.2019.07752

Investigation of Pedestrian Accessibility to Railway System Stations in the Context of Sustainable Urban Development: The Case of Konya

Raylı Sistem İstasyonlarına Yaya Erişilebilirliğinin Sürdürülebilir Kentsel Gelişme Bağlamında İncelenmesi: Konya Örneği

Sedef ERYİĞİT

ABSTRACT

Tram systems, which form the basis of sustainable transportation systems, are operated on specified trails according to their characteristics, and are less accessible than other types of wheeled transportation. In order to ensure sustainable urban development and to increase the efficiency of tram systems, it is necessary to take pedestrian accessibility into consideration in the planning of tram systems. The main purpose of the present research is developing suggestions to meet the passenger expectations for services offered in rail systems by evaluating the rail mass transportation systems and pedestrian transportation with the concept of accessibility to provide sustainable development in cities. The sample of the present research consists of tram stops in Konya city center. In order to define the quality of service and the problems encountered by the passengers on the pedestrian access to the tram stops, a survey questionnaire was conducted with those who preferred trams for their trips in addition to observations conducted in the sample area. Problems encountered in pedestrian accessibility in tram stops were defined with the results of the observations and the questionnaire findings, and suggestions were developed to provide sustainable urban development by improving the performance of tram lines.

Keywords: *Accessibility; pedestrian; rail public transportation systems; sustainable urban development.*

ÖZ

Sürdürülebilir ulaşımın temelini oluşturan toplu taşıma sistemleri içerisinde tramvay sistemleri; özellikleri itibariyle belirlenmiş raylar üzerinde işletilmekte ve diğer lastik tekerlekli ulaşım türlerine göre erişilebilirliği düşük olmaktadır. Sürdürülebilir kentsel gelişmenin sağlanması ve tramvay sistemlerinde verimliliğin arttırılabilmesi için tramvay sistemlerinin planlamasında, yaya erişilebilirliğinin göz önünde bulundurulması gerekmektedir. Bu araştırmanın temel amacı; kentlerimizde sürdürülebilir gelişmenin sağlanabilmesi için raylı toplu taşıma sistemleri ile yaya ulaşımının erişilebilirlik kavramıyla birlikte değerlendirilerek raylı sistemlerde sunulan hizmetlerin yolcu beklentisini karşılamasına yönelik önerilerin geliştirilmesidir. Araştırmada örneklem alan olarak Konya kent merkezinde bulunan tramvay hatları istasyonları seçilmiştir. Tramvay hattı istasyonlarına yaya erişilebilirliğinde sunulan hizmet kalitesinin ve yolcuların karşılaştıkları sorunların tespit edilebilmesi için örneklem alanda gözlemler ve yolculuklarında tramvayı tercih edenler ile anket çalışması yapılmıştır. Yapılan gözlemler ve elde edilen anket bulguları sonucunda tramvay hattı istasyonlarına yaya erişilebilirliğinde karşılaşılan sorunlar belirlenerek tramvay hatlarının performansının arttırılarak sürdürülebilir kentsel gelişmenin sağlanmasına yönelik öneriler geliştirilmiştir.

Anahtar sözcükler: *Erişilebilirlik; yaya; raylı toplu taşıma sistemleri; sürdürülebilir kentsel gelişme.*

Department of Urban and Regional Planning Turkey, Necmettin Erbakan University Faculty of Engineering and Architecture, Konya, Turkey

Article arrival date: **November 12, 2018** - **Accepted for publication:** **September 25, 2019**

Correspondence: Sedef ERYİĞİT. **e-mail:** sedef_sendogdu@hotmail.com

Introduction

People live in 'cities' where social life is organized according to professions and division of labor, production is heavily dependent on industry, commerce and the service sector, and complex human relations are widespread (Keleş, 1998). The fordist mode of production style developed with the industrialization process in the 18th century and the rapid development of technology resulted in changes in many areas, such as the acceleration of migration to the urban area, the expansion of the borders of cities, the services sector in cities, cultural structure, land use and transportation network. Within this change, it is the 'transportation system' that is one of the most basic functions in the formation and growth of the human-generated environment, and provides communication and interaction between all functions of the cities (Vuchic, 2007). The transportation systems defined as "economic, rapid and secure displacement of people and goods in order to provide the connections between settlements and various regions" are not only the most important elements of a powerful economy but also the most important factor directly contributing to the formation of the society and the sustainable urban development (Tümertekin, 1987). However; the plans made on the basis of the continuous growth of today's cities, the inability to integrate the land use decisions and transportation plans, and the adoption of demand-sensitive approaches in transportation plans are not human but vehicle oriented (OECD, 1996; Litman & Burwell, 2006). Vehicle-oriented approaches that focus on increasing traffic speed on the mobility basis of transportation result in the destruction of the environment, increase of traffic congestion, environmental, social and economical damages in the cities and failure in sustainable urban development (Eryiğit, 2012). Accessibility-based approaches need to be adopted by prioritizing human beings in the development and planning of public transportation systems in order to reduce transportation-related problems in cities and provide sustainable development in our cities.

The development of public transportation in the cities contributes to the efficient use of resources, a healthy environment and the increase in the accessibility of urban spaces. However, because of the inadequacy of trip frequency of public transportation systems and the comfort provided by private vehicles (the possibility to traveling from the door to the door without changing any mode of transportation, being not affected by climatic negativity etc.), the trips by public transportation are less preferred; hence, the private vehicle use rates increases in our country as so all over the world. Additionally; while overgrowth in cities leads to the spread of living areas from central areas, these changes in urban morphology encourage the use of private vehicles (Özkazanç & Özdemir Sönmez, 2017). Undoubtedly, in order to ensure sustainability, the situation is in favor of public transportation needs to be supported by various policies. Since it is impossible to eliminate the traffic congestion all around the world, the main objective of transportation planning should be developing timesaving and safe transportation systems, which is only possible with the development of a rail public transportation system. Rail transportation systems are superior than the other transit systems, since they can transit more passengers to their destinations with less vehicles, they are economic, provide land use efficiency and don't create pollution (Gündüz, Kaya & Aydemir, 2011). However; since rail transportation systems operate on defined rails due to their characteristics, their accessibility is lower than other types of transportation and they need integrated transportation systems. Therefore; one of the policies for ensuring sustainable urban development and increasing the efficiency of rail systems is to increase the "pedestrian accessibility" to rail public transportation types. Pedestrian accessibility is a concept related to both the physical characteristics of the pedestrian, the adequacy of pedestrian areas in terms of service, and the appropriateness of the spatial characteristics of the related areas.

The main purpose of the present research is evaluating pedestrian accessibility, which is one of the most important criteria for sustainable urban development, in terms of rail systems, which are one of the most popular types of public transportation in our country.

Within the scope of the present research, the satisfaction levels from the rail systems in Konya were determined and the problems they encountered in accessing the stations were studied and suggestions were developed to increase the sustainable urban development by providing comfortable and safe access to the railway system stations for everyone living in the city. The suggestions developed as a result of the present research are of guiding quality in terms of the development of accessibility as one of the criteria of sustainability, to be applied to rail system trips, emphasizing the importance of pedestrian accessibility in rail system planning, increasing demand for rail systems and ensuring sustainable urban development. Due to the need for considering not only measureable concrete indictors but also the abstract values, which cannot be measured, only perceived, in evaluating the accessibility of pedestrians to rail systems, the present research is important in providing healthy solutions to problems encountered in the accessibility of pedestrians to rail system stops.

Pedestrian Accessibility to Rail System Stops

In order to ensure sustainable urban development; facilities, such as education, health, and recreation must be

socially adequate and accessible, discriminating and excluding policies and practices must be fought, all people including specifically vulnerable groups such as women, children, elderly people, people with disabilities and the poor must have equal rights and these rights must be respected (UN, 1997).

The concept of accessibility, defined as the ease in reaching of people and commercial activities to desired facilities, products and activities, can be evaluated based on time, cost, comfort and risk criteria (Ingram, 1971; Engwicht, 1993; Bhat, Handy, Kockelman & Mahmassani, 2001; Özuysal, Tanyel & Şengöz, 2003; Geurs & van Wee, 2004).

Accessibility, one of the driving forces in achieving sustainable urban development, requires the development of public transportation systems in order to reduce the use of private vehicles in travel habits, by prioritizing human beings and diversifying modes of transportation (Hansen, 1959; Engwicht, 1993). Accordingly; the main purpose of accessibility planning is to make distances easily accessed with various transportation options, especially with non-motorized modes of transportation (pedestrian, bicycle) and public transportation (Barter & Raad, 2000).

The development of the urban public transportation systems and the implementation of deterrent policies for private car use are among the basic strategies of cities experiencing urban transportation problems. Rail public transportation systems are superior to other options of public transportation due to the advantages of high transportation capacity, speed, dependability on the schedule, safe and reliable travel, increasing efficiency in urban areas, taking an effective role in reducing traffic congestion, being environment friendly, low cost of operation despite high construction costs, not causing noise pollution and enabling social cohesion through mass transportation (Gökdağ, 1999; Çubuk, Türkmen & Erdem., 2002; Gündüz et al., 2011; Salicru, Fleurent & Armengol, 2011; Keskin, 2013).

The success of rail public transportation systems in many cities due to their positive contribution to sustainable urban development is based on travel time, duration of waiting at stops, capacity, occupancy rate, physical characteristics of stops, average speed, travel cost, security, comfort and accessibility criteria (Curtis, 2007; Benenson, Martens, Rofe & Kwartler, 2010).

Accessibility criteria for rail public transportation systems are covered in three parts: transportation to stops, travel time, and access to destinations (Mavoa, Witten, McCreanor & O'Sullivan, 2012). Access to rail transportation stops is the first and most important step of access to public transportation services, and accessibility is considered to be physical proximity to stops by many previous studies (Hsiao, Sterling & Weatherford, 1997; Furth, Mekuria & SanClemente, 2007; Biba, Curtin & Manca., 2010; Currie, 2010). However, only measuring the travel time and physical proximity to stops in rail public transportation systems result in failure in an objective evaluation of the quality of service offered.

Due to its characteristics, rail systems are operated in specified routes, and the whole system is considered as the stops located in these lines and the pedestrian areas where access to these stops are provided. Specified pedestrian areas; can connect the starting point of the trip with the rail system lines, the rail systems with other transportation types, and the rail system with destinations. Therefore; the performance of rail systems is based on the passenger expectations and quality of service offered in pedestrian access to rail system stops.

Accordingly, the purpose of the present research is defining the problems encountered in pedestrian access to the rail system stops and determining the level of satisfaction of the expectations of the passengers with the offered services.

Research Method

The present research was developed on two main components; pedestrian accessibility which is important in terms of ensuring sustainable urban development and rail systems which can provide a basis for evaluating pedestrian accessibility. In this respect, first the previous researches in the literature on the use of accessibility criteria in the decision-making stages of rail system planning were studied. Accordingly, it was found that the evaluation criterion of service and passenger expectation for accessibility is a concept that is rarely used in the planning process rather than an efficiency indicator in the decision-making stage.

In the study, tramlines in Konya city were chosen as sampling area. The fact that trams are the least used mean of vehicle transportation in Konya (8.9%) was effective in choosing the sampling area (Figure 1) (KBB, 2013).

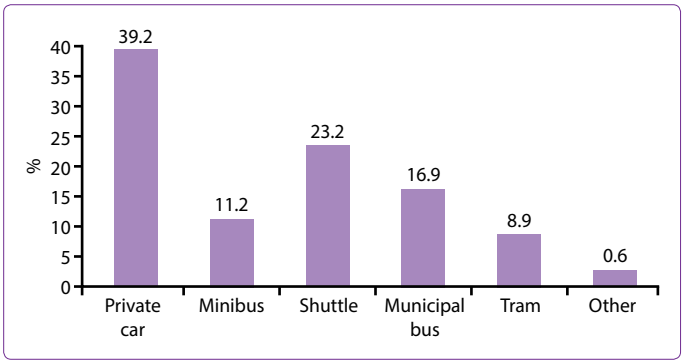

Figure 1. Distribution of Konya-city vehicle transportation types (KBB, 2013).

In this regard, the methodology of the research was based on defining of the services offered for pedestrian accessibility in Konya city rail systems and the expectations of the passengers. For this purpose; the needs in pedestrian accessibility to tram stops were detected first by defining the current situation of the tramline of Konya city. Additionally; answers to the following two basic questions were sought focusing on the evaluation of the pedestrian areas used in pedestrian accessibility to rail system stops:

- What is the quality of the services offered for pedestrian access to rail system stops?
- What is the quality of preferred pedestrian areas for access to the rail system stops compared to the passenger expectations?

The subcomponents identified in responding to the identified questions are presented in Figure 2.

For the field study, questionnaires, prepared to evaluate services offered for pedestrian accessibility and passenger expectation measures, were applied on the passengers, who reach to tram stops on foot, and the obtained data were evaluated with observation findings.

In the first part of the three-part questionnaire; passengers with pedestrian access to the tramway stations were asked questions in order to determine their demographic characteristics, the time interval the tram was frequently preferred, the frequency of use of the tram, the purpose of the tram passengers' trips and whether the passengers had connected trips by means of the tram. In the second part of the questionnaire; questions designed to determine the availability of spaces for disabled/elderly people in order to find out whether the preferred pedestrian areas for access to tram stops provide equal opportunities for everyone living in the community; and in the third part questions designed to determine the levels of satisfaction from preferred pedestrian areas in access to tram line stops, and the quality of the intersection points at stops were asked. The questionnaire form prepared in accordance with the abovementioned components was conducted on 795 participants using tram station in November, 2017 and their analysis was done through variables.

In the first and second group of questions, the variables are scored on a three point likert type system as "Never, Sometimes, Often", "Very difficult, Difficult, Easy" and in the third group questions the variables are scored on a five point likert type system as "Very bad, Bad, Average, Good, Very good" I absolutely disagree, I disagree, undecided, I agree, I absolutely agree".

The evaluation of the questionnaire items was based on the intervals defined in Table 1 and Table 2 and analyses were done with the average values of the answers given

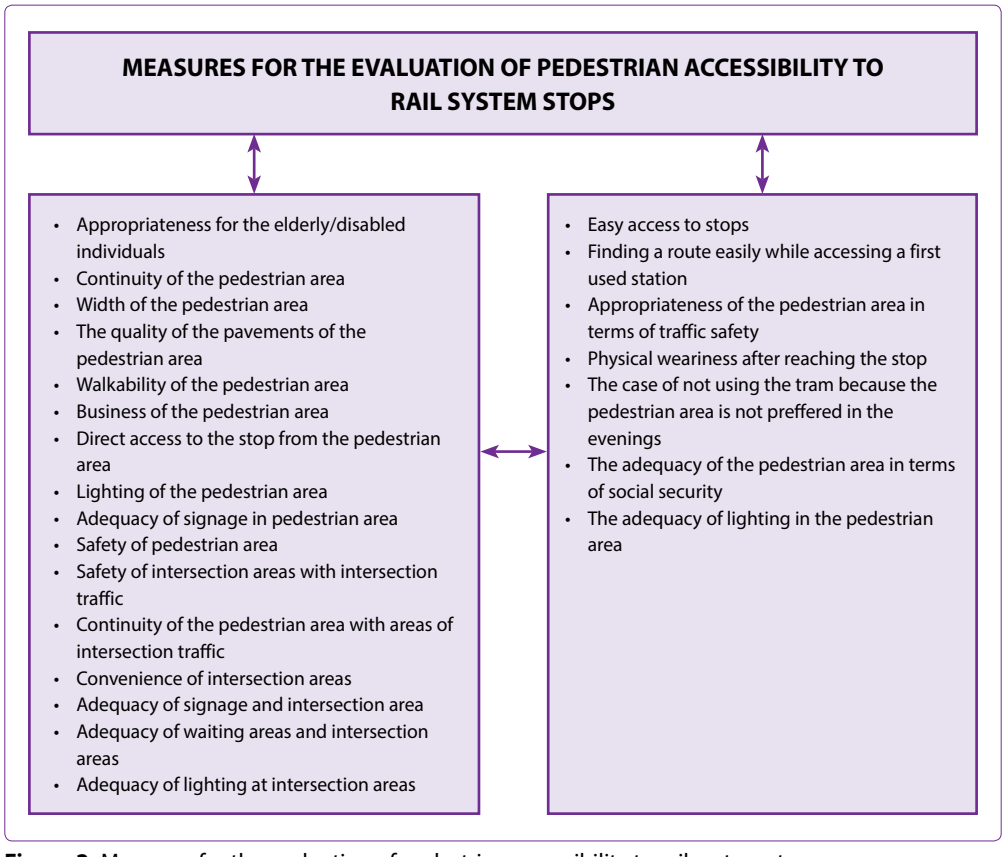

Figure 2. Measures for the evaluation of pedestrian accessibility to rail system stops.

Table 1. Three-point Likert type scale score intervals

Weight	Choices*		Bound**
3	Often	Easy	2,34-3,00
2	Sometimes	Difficult	1,68-2,33
1	Never	Very difficult	1,00-1,67

*If the value is ≤ 2, 33, use is considered as rare; if the value is >2,33 use is considered as frequent.
**If the value is ≤ 2, 33, it is considered as very difficult; if the value is >2,33 it is considered as easy.

Table 2. Five-point Likert type scale score intervals

Weight	Choices*		Bound**
5	Very good	Absolutely agree	4,21-5,00
4	Good	Agree	3,41-4,20
3	Average	Undecided	2,61-3,40
2	Bad	Disagree	1,81-2,60
1	Very bad	Absolutely disagree	1,00-1,80

*If the value is ≤ 3,40, quality is considered as bad; if the value is >3,40 quality is considered as good.
**If the value is ≤ 3,40, quality is considered as disagreed; if the value is >3,40 quality is considered as agreed.

by the participants. Interval width was calculated with "Interval width=sequence width/number of groups formula as "Interval width=2 / 3 = 0,67, 4 / 5 = 0,80.

Interviews, observation and technical drawing methods were other methods used to obtain findings in the research.

Research Findings

General Characteristics and Urban Transportation of Konya City

Konya is located in Central Anatolia region of Turkey, and surrounded by Niğde province on the east, Aksaray province on the north-east, Ankara and Eskişehir on the north, Afyon and Isparta on the west, and Antalya and Karaman provinces on the south (Figure 3).

With its 41000km² survey, Konya is the largest city in Turkey and has a population of 2,180,149 people according to 2017 Address Based Population Registration System. While 60% of the population (1.301.222) live in central districts (Meram, Selçuklu, Karatay), 40% (878.927) live in other districts. Of the population of Konya city center, 49% live in Selçuklu, 27% live in Meram and 24% live in Karatay central districts (TUİK, 2017).

The transportation system of the city of Konya, which develops around Alaeddin Tepesi focus, presents a radial structure (Figure 4).

Observations conducted showed that, personal vehicle use within the city increases rapidly, due to the linear development of the city, the radial structure of city road network and the limited accessibility of mass transportation systems. Private vehicle ownership rate is highest in Meram district (161 vehicles per 1000 people), and the lowest in Karatay District (Figure 5) (KBB, 2013).

There are Municipality Buses Administration, Municipality Tram Administration and Minibus Cooperative, which provide public transportation and transit transportation services to meet transportation demand in Konya city center. Konya Metropolitan Municipality Tram Administra-

Figure 3. Location of Konya City.

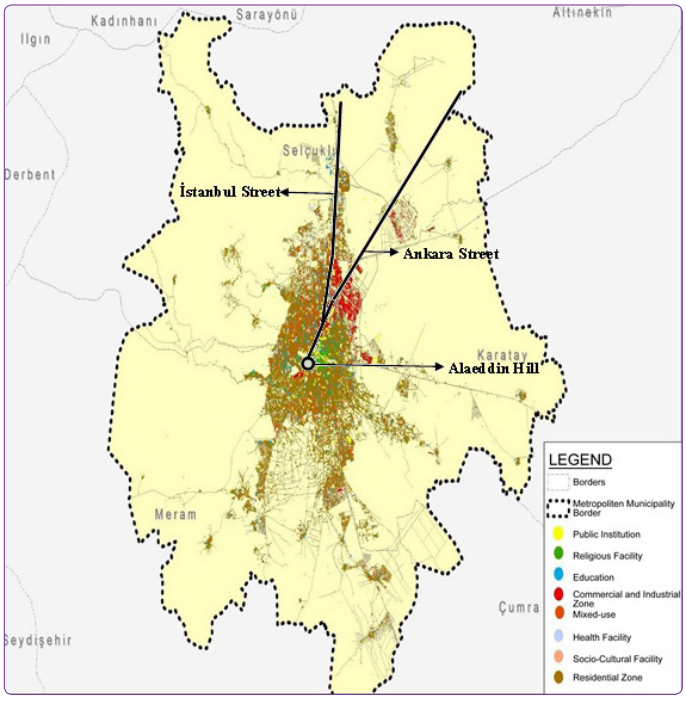

Figure 4. Land-use map of Konya City (KBB, 2013).

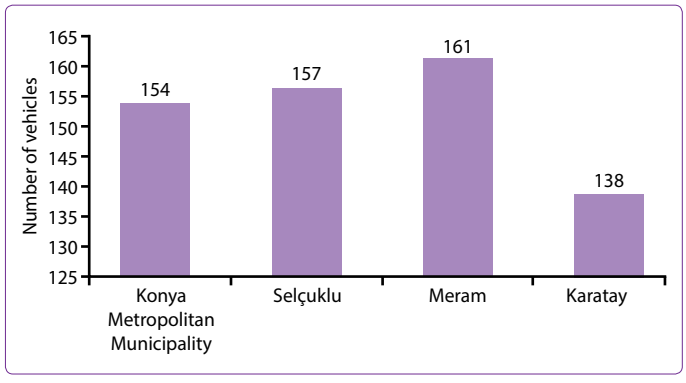

Figure 5. Number of Personal vehicle per 1000 in Konya City Center (KBB, 2013).

Figure 6. Konya Tram lines and stops (KBB, 2018).

tion offers public transportation services in 2 lines in total; Alaeddin Tepesi- Selçuk University Campus Tram Line and Alaeddin Tepesi-Adliye Tram Line.

General Characteristics of Konya City Rail Systems

Alaeddin Tepesi - Selçuk University Campus tramline was put into service in 1996, and today it operates on a total of 18.9 km of double routes and a single line of 3.5 km within the campus with 36 stops on the line. Tram line starting from Alaeddin Tepesi and reaching to the campus of Selçuk University, carries an average of 97,474 people during the day, and the average duration of the one-way trip on the tram is 57 minutes (KBB, 2018). Alaeddin Tepesi- Adliye Tram line was put into service in 2015, and operates on a 7 km double route line with 9 stops. Tramline starting from Alaaddin Tepesi and ending at Adliye carries an average of 4912 people everyday and the one-way trip only line takes around 25 minutes (Figure 6) (KBB, 2018).

Observations in the Area

According to the findings of the observations, Konya city tramlines mostly serve for Selçuklu and Meram districts. According to the findings of the analysis of the walking distance (500 m.) between the tram stops and the residential areas in the city, the residential areas are outside the walking distance to the stops, the integration of tramlines with general transportation systems cannot meet the demand and the private vehicle ownership is high in Selçuklu and Meram districts (Figure 7).

According to the observations in the area, there are physical arrangements for visual impairments in the stops;

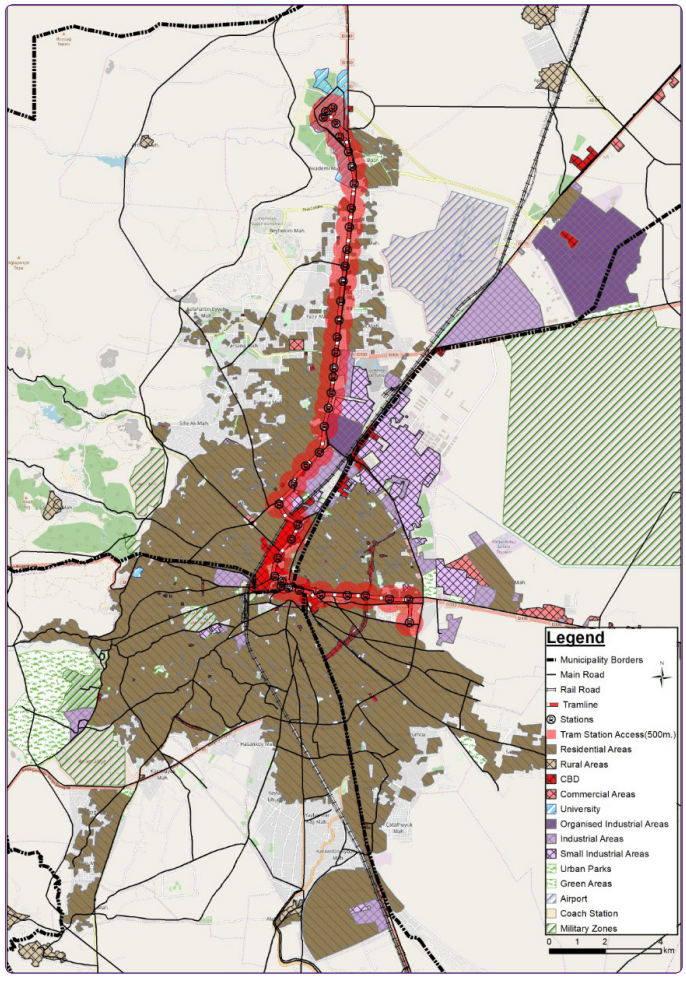

Figure 7. Walking Distances to Konya Tramline Stops.

Figure 8. Handicapped design at tramline stops and around.

Figure 9. Bad quality pavements of Pedestrian areas providing access to tramline stations.

Figure 10. Lack of direct access from Pedestrian areas to tramline stops.

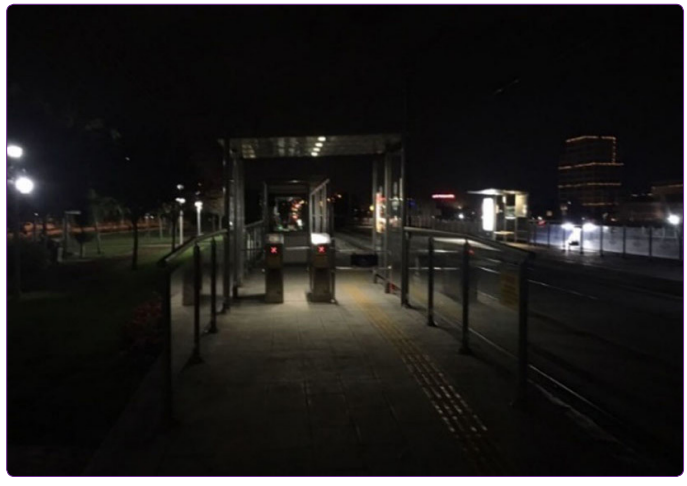

Figure 11. Inadequate lighting at tramline stops.

however there is no continuity of physical arrangements and no sound systems for the hearing impaired around the stops (Figure 8). Additionally, the pavements of the pedestrian areas providing access to stops are in a bad condition (Figure 9), pedestrian areas don't provide direct access to stops (Figure 10), and the lighting (Figure 11) and signaling (Figure 12) around stops are inadequate.

It was also observed at stops in the city center that waiting areas where pedestrians were included in traffic at intersections were inadequate (Figure 13a, b), there was no continuity of roads (Figure 14) and there was no traffic safety for pedestrians (Figure 15a, b).

Questionnaire Findings

According to the tram stop users' demographic structure analysis, there is no significant difference across genders, and the rates of male and female users are almost the same; most of the tram users are within 15-19 and 20-

Figure 12. Lack of signaling at pedestrian areas providing access to tramline stops.

Figure 13. (a, b) Inadequate waiting spaces for pedestrians at intersections.

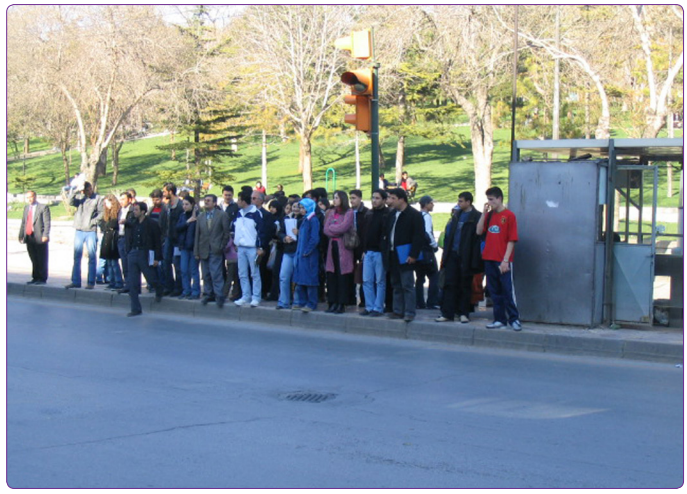

Figure 14. Discontinuity of roads providing access to tramline stops.

Figure 15. (a, b) Lack of pedestrian safety at tramline stops.

24 age ranges; and most the participants are high school graduates or hold bachelor's degrees (Table 3).

According to the results of analysis on time periods when tram is preferred and tram use frequency in Konya, tram use is never preferred between 24:00-06:00, while it is sometimes preferred during other times of the day and it is highly preferred during rush hours (08:00-10:00 and 16:00-18:00) (Table 4).

Table 3. Demographic Data related to Konya Tram Stop Users

		Number	%
Gender	Female	391	49,18
	Male	404	50,82
	Total	795	100,00
Age	6-14	9	1,13
	15-19	185	23,27
	20-24	331	41,64
	25-35	112	14,09
	36-45	68	8,55
	46-55	37	4,65
	56-65	31	3,90
	66-75	18	2,26
	76-+	4	0,50
	Total	795	100,00
Education	Primary S. Graduate	55	6,92
	Secondary S. Graduate	86	10,82
	High S. Graduate	322	40,50
	Bachelor's degree	315	39,62
	MA/PhD Degrees	17	2,14
	Total	795	100,00

Table 4. Tram use time periods and frequency

		$\bar{X}$	S
Time periods	06:00-08:00	1,83	1,58
	08:00-10:00	2,04	1,54
	10:00-12:00	1,70	1,25
	12:00-14:00	1,74	1,25
	14:00-16:00	1,81	1,33
	16:00-18:00	2,13	1,46
	18:00-20:00	2,00	1,40
	20:00-22:00	2,01	1,41
	22:00-24:00	2,12	1,37
	24:00-06:00	1,11	0,69

Table 5. Purpose of tram use

	Number	%
Education	400	50,31
Work	162	20,38
Shopping	106	13,33
Socio-cultural	82	10,31
Other	45	5,66
Total	795	100,00

According to the analysis on the purpose of use of the tram; most of tram users (50.31%) mostly travel for educational purposes (Table 5).

Table 6. Tram use frequency analysis

	Number	%
Everyday	376	47,30
3-4 days a week	227	28,55
1 day a week	98	12,33
2-3 days a month	87	10,94
Never	7	0,88
Total	795	100,00

Table 7. Analysis of means of transportation to tram stops

	Number	%
On foot	607	76,35
Bicycle	9	1,13
Private car	31	3,90
Taxi	2	0,25
Bus	88	11,07
Minibus	17	2,14
Service	2	0,25
Tram	39	4,91
Total	795	100,00

Table 8. Analysis of means of transportation to the final destination after getting off the tram

	Number	%
On foot	653	82,14
Bicycle	2	0,25
Private car	11	1,38
Taxi	4	0,50
Bus	109	13,71
Minibus	9	1,13
Service	4	0,50
Tram	3	0,38
Total	795	100,00

According to the analysis on the use of frequency; tram is frequently used everyday (47.30%) (Table 6). The fact that tram users are mostly students, the rate for everyday use is high.

According to the analysis on the means of transportation preferred to access to tram stops, most of the passengers (76.35%) get to tram stops on foot (Table 7).

According to the analysis on the means of transportation to the final destination after getting off the tram; most of the passengers (82.14%) get to their final destinations after getting off the tram on foot (Table 8).

According to the analysis on the duration of trip to get to the tram stops for tram trips, it takes 1-5 min. (32.83%) and 6-10 min. (37.99%) for most of the passengers to get to the tram stops (Table 9).

According to the analysis on whether everyone is offered equal opportunities at preferred pedestrian areas to access Konya city tram stops, most of the participants (59.37%) stated that access to tram stops is difficult for individuals, who are handicapped/elderly/with children (Table 10).

According to the analysis on the quality of the pedestrian areas used to access tram stops, the width, business, and surrounding of the road is good, but continuity, pavement, convenience of the road for the desired walking pace, direct access to tram stops, lighting, signage and safety are average (Table 11).

According to the analysis of the physical quality of pedestrian crossings to tram stops, crossing safety, continuity, convenience of infrastructure for walking, lighting and signage, and the adequacy of waiting areas at roundabouts are "average" (Table 12).

According to the analysis on satisfaction from accessibility to tram stops, most of the participants "agree" that they can access to stops easily and they love using trams while they are "undecided" about finding directions to tram stops easily, adequacy of accessibility in terms of traffic safety, the feeling of fatigue after reaching the stop, avoiding tram use because of feeling afraid to walk to stops in the evenings, appropriateness of the area in terms of social security and lighting of the area (Table 13).

Table 9. Analysis of the duration of travel time to tram stops

	Number	%
1 min	33	4,15
1-5 min	261	32,83
5-10 min	302	37,99
10-15 min	147	18,49
15-20 min	44	5,53
20 min +	8	1,01
Total	795	100,00

Table 10. Analysis of appropriateness of the pedestrian area used to access tram stops for handicapped/elderly/with children

	Number	%
Very difficult	143	17,99
Difficult	472	59,37
Easy	180	22,64
Total	795	100,00

Table 11. Quality of the pedestrian areas used to access tram stops

	$\bar{X}$	S
Continuity	3,16	1,63
Width	3,41	1,49
Pavement (continuous, decent, etc.)	3,35	1,53
Convenience for walking (is it possible to walk at desired pace?)	3,25	1,75
Business	3,58	1,64
Width of surrounding	3,47	1,45
Direct access to stops	3,35	1,68
Lighting	3,40	1,70
Signage	3,01	1,80
Safety	2,95	1,85

Table 12. Analysis of the physical quality of pedestrian crossings to tram stops

	$\bar{X}$	S
Crossing safety	2,69	1,59
Continuity of crossing	3,03	1,46
Walking convenience	3,01	1,58
Adequacy of traffic lights	3,07	1,64
Adequacy of waiting areas for crossing	2,82	1,68
Adequacy of lighting	3,25	1,46

Table 13. Analysis of satisfaction from accessibility of tram stops

	$\bar{X}$	S
I can easily access to the stop	3,48	1,72
I can easily find my direction to a stop I have never used before/signage is adequate	3,20	1,73
I believe that the road I walk is safely separated from traffic / appropriate in terms of traffic safety	3,04	1,79
I feel tired after reaching the stop	2,90	2,10
I don't prefer tram since I want to avoid walking to the stop in the evenings	2,67	2,04
I don't feel social security anxiety in the area I walk (harassment, smash and grab, etc.)	3,03	1,98
The area I walk is appropriate in terms of lighting	3,26	1,72
I like using the tram for transportation	3,44	1,94

Evaluation and Suggestions

Today, accessibility-based approaches that prioritize human beings need to be adopted in transportation planning to ensure sustainable urban development. Accordingly, in order to be able to make "people oriented" transportation plans; pedestrian and bicycle transportation among non-motorized modes of transportation should be encouraged, mass transportation should be developed and walkable areas should be created. Rail systems integrated with pedestrian access; is one of the most efficient types of transportation that contribute to highly accessible, sustainable urban development by enabling the mobility of many people.

According to the findings of the field survey conducted to evaluate the services provided for pedestrian accessibility at tramlines stops in Konya, pedestrian areas do not comply with accessible design criteria, and the spaces do not provide all the people living in the city with equal rights. Additionally, pavement of pedestrian areas is not convenient for walking, the increase in the walking distance result in bodily fatigue, pedestrian areas that provide access to stops outside the city center are not busy enough, tram is not preferred after dark due to social security threat and lack of lighting, and the signage is not enough for those who will use the tram stops for the first time. All these factors result in preferring private vehicles for transportation more. It was found that because vehicle prioritized transportation approaches are adopted in Konya, signage works in favor of vehicles at intersections where pedestrian traffic crosses vehicle traffic, waiting time at roundabout increases for pedestrians and they feel bodily fatigue. It was also found that pedestrians wait on vehicle roads and there is no pedestrian safety, because waiting areas at roundabouts are inadequate.

According to the analysis on passenger expectations in the sample area, pedestrians are ignored in transportation approaches throughout the city and there is no traffic safety for pedestrians, integrated transportation approaches are not adopted throughout the city, pedestrians are ignored in integrated transportation approaches and the distance between the starting point of the trip and the stops is long accordingly, travel times increase and bodily fatigue is experienced after the trips. Additionally, passengers don't prefer trams after dark because social security is not provided at pedestrian areas.

Consequently, the findings of the present research conducted to evaluate whether services offered for pedestrian accessibility at tram stops in Konya city meet passenger expectations showed that offered services don't meet expectations completely. Accordingly, for the services offered for pedestrian accessibility at rail system stops meet passenger expectations;

- Arrangements should be made to offer equal services at pedestrian areas to everyone, especially the elderly and the handicapped, living in the society,
- Infrastructure of pedestrian areas should be developed and pavements should be convenient for walking,
- Lighting should be enough so that the tram can be used in the evenings,
- Signage should be provided for those who don't know the city and will use the tram stops for the first time
- Measures should be taken to provide social security at pedestrian areas,
- Smart roundabout applications should be used at intersections, and waiting time should be decreased by prioritizing the pedestrians,
- Waiting areas should be larger where pedestrian mobility is high to provide traffic safety for pedestrians,
- Walking distances between the starting point of the trip and the stops should be arranged in accordance with walking distance of 500m in order to reduce physical fatigue and integrated approaches should be adopted where such arrangements are not possible to offer access to trams by other means of transportation,
- Passenger expectations should be taken into consideration in rail system planning to improve tram system performance.

The security of the access of the rail system stops is an important issue in terms of both the quality of the service offered and the expectations of the passengers. Pedestrian areas used to access stops having no accident risks in terms of social security and physical safety has an important effect on accessibility. For this reason, social and physical security factors should be taken into consideration for further rail system accessibility planning.

The concept of accessibility studied in the present research is the most important criterion in transportation preferences. However, it was found that only distance and time criteria were taken into consideration while planning the tram stops accessibility while user expectations and the quality of the services were ignored, which will have a negative effect on the tram system performance. For this reason, in order to reduce private vehicle dependency in cities and to improve rail system performances and accordingly to ensure sustainable urban development, the factor of pedestrian accessibility to stops should be taken into consideration in rail system planning and the services offered to passengers should meet their expectations.

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