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THE IMPACT OF THE TRAMWAY ON PEDESTRIAN ACCESSIBILITY IN THE NEW CITY OF ALI MENDJELI IN CONSTANTINE

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ABSTRACT

The new city of Ali Mendjeli in Constantine has capitalized on the extension of the tramway line by adopting a sustainable mode of transportation that has significantly reduced car usage and alleviated congestion in the city. The introduction of the tramway has also led to the creation of outdoor amenities such as widened sidewalks, green spaces, and resting areas, which have promoted pedestrian activity.

The objective of our research was to examine the impact of the tramway's arrival on pedestrian accessibility in this city. To achieve this, we employed a mixed methodology that combined quantitative and qualitative tools. We distributed a questionnaire to a sample of residents in the new city of Ali Mendjeli and conducted on-site observations as well.

The findings of our study clearly demonstrated that the arrival of the tramway in the new city of Ali Mendjeli and the accompanying outdoor enhancements along its route have had a positive impact on pedestrian accessibility in the city.

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1. Introduction.

Cities have evolved throughout history based on the available means of transportation within their territories. Initially, cities were designed to be pedestrian-friendly and human-scale. However, with the advent of the industrial revolution, transportation began to be primarily used for the movement of goods, which radically transformed urban planning and development.

In reality, it was the introduction of the automobile in the 1920s, that significantly influenced the evolution of cities. Cars allowed cities to expand beyond their traditional boundaries, creating suburbs and satellite towns. They played a significant role in the peripheral redevelopment of cities (Beier, 2020). This trend intensified in the 1970s, enabling people to commute longer distances for work, leisure, and their return home in the evenings.

Over time, the intensive use of cars has led to increased urban congestion and a significant rise in air pollution (Shamsuddin et al., 2012), which have had adverse effects on public health. Diseases that were not common before the 20th century, such as asthma and cardiovascular diseases (Frank et al., 2010), have become more prevalent due to air pollution. Additionally, car dependency has also

contributed to a more sedentary lifestyle, promoting the occurrence of diseases such as obesity and diabetes (Glazier et al., 2014).

Currently, individuals primarily rely on vehicles (Glazier et al., 2014) to travel to their destinations, making it the most commonly used mode of transportation (Moayedi et al., 2013).

Recently, sustainable development has become a priority for researchers and policymakers in urban planning. Cities are adopting strategies to limit space consumption, including urban rehabilitation, renovation, and redevelopment. The use of non-motorized and public transportation is encouraged to improve mobility and accessibility in the city. This approach entails a preference for public transportation, which is more community-oriented, as opposed to individual car usage (Maupu & Wiel, 2006).

In the face of challenges that cities encounter on social, economic, and environmental levels, promoting the use of sustainable modes of transportation is increasingly common. This involves encouraging walking and implementing sustainable urban planning that considers health issues (Le Gall et al., 2014).

In this regard, the pedestrian potential within a city affects both the economy and people's health. On average, people walk about 500 meters in the city. Beyond this distance, people typically use other means of transportation, such as cars, especially for those who do not have easy access to public transportation. The design of the city itself can sometimes be impractical for pedestrians (Shamsuddin et al., 2012). This aligns with the idea that there is a correlation between the urban layout of a neighborhood and the level of physical activity of its residents (Frank et al., 2010; Van Dyck et al., 2009).

Improving public transportation in the city helps reduce car lanes, freeing up space to create sidewalks and outdoor amenities, but it may also lead to a reduction in parking spaces and lots.

The tramway is considered a mode of transportation that has a positive impact on pedestrian accessibility in the city. It helps reduce car traffic, road congestion, and road accidents. Furthermore, the tramway helps decrease greenhouse gas emissions and air pollutants, enhancing safety and the city's image (Stambouli, 2005). It promotes walking by making streets safer for pedestrians through the redesign of outdoor spaces. The tramway can also provide connections with other modes of transportation such as buses, bicycles, and taxis, facilitating access to goods, services, education, work, leisure, etc. (Da Cunha et al., 2005). Finally, the tramway contributes to creating attractive and aesthetic open spaces for city residents (Van Dyck et al., 2008).

2. Literature Review.

Over the years, urban planning has been marked by sprawling cities that have encouraged car usage at the expense of walking. Unfortunately, this trend has contributed to the increase in health problems such as obesity, diabetes, cardiovascular diseases, among others.

Walking has become an important research topic in current studies (Moayedi et al., 2013; Dovey & Pafka, 2020). Researchers have started studying the impact of pedestrians on health and promoting health-oriented urban planning that emphasizes walkability or the built environment that encourages walking to various destinations (Manaugh & El-Geneidy, 2011). Since the 2000s, multidisciplinary research on walkability has also been used to study walking as a mode of transportation in public health (De Vos et al., 2023).

Health-promoting cities are designed in a way that encourages walking and other active modes of transportation (Raulin et al., 2016). Walking has become a central focus in research. Physical characteristics, urban design quality, and individual perceptions are factors that can influence how a person perceives their environment as conducive to walking (Ewing & Handy, 2009). This includes wide streets with spacious sidewalks and safe crossings, well-defined bike lanes, public spaces such as parks, gardens, and squares, and functional mixity where shops, workplaces, and housing are located close to each other. All of this aims to make walking easier and more enjoyable. Accessibility can also have a significant impact on individuals' travel habits, influencing their choice of transportation mode, distance and duration of trips, as well as their frequency (De Vos et al., 2023).

The concept of "walkability" has become an increasingly crucial issue as urban planners, governments, and public health stakeholders increasingly promote pedestrian mobility (Pivo & Fisher, 2011).

Rather than delving into an exhaustive literature review to understand the concept of "walkability," which has already been extensively explored by many researchers, we aim to clarify the relationships between different phenomena contributing to walkability (Boukelouha & Gauthier, 2020). We will simply focus on a few definitions that align with our positioning in this study.

The concept of walkability helps determine whether the built environment of a neighborhood encourages people to walk (Wang & Yang, 2019).

According to Dovey and Pafka (2020), the walkability of a neighborhood is determined by several capacities that are reflected in urban forms in three different ways: the density of buildings and people, the combination of diverse functions and attractions, and the means of access that enable navigation between them.

According to Lo (2009), the reasons why pedestrians walk are diverse and can be related to transportation, such as commuting or transitioning between different modes of transport. However, the definition of walking is not limited to these purely functional aspects. Indeed, some people walk for reasons other than transportation, such as exercise, relaxation, shopping, social interactions, seeking spiritual well-being, or simply for physical activity.

Regarding the issue of walkability in the city, it raises multiple challenges such as pedestrian safety, the quality of the urban environment, improving quality of life, and the appropriation of public spaces and infrastructure (Ouzir, 2022).

There are numerous benefits to walkability. It encourages physical activity, which is beneficial for physical and mental health. It reduces air pollution and greenhouse gas emissions by decreasing car usage. Additionally, it contributes to a healthy lifestyle (Horak et al., 2022) by creating pleasant and safe public spaces for pedestrians, promoting social interactions, and reducing stress.

Today, many cities worldwide are implementing policies and programs to encourage walkability. This can include sidewalk and crosswalk improvements, the creation of bike lanes, reducing car traffic speed, developing pedestrian-friendly public spaces, and promoting functional mixity to bring residences, workplaces, and shops closer together.

In conclusion, walkability is an important concept for promoting health and the development of sustainable cities. Urban planners, policymakers, and citizens must work together to create health-promoting urban spaces that encourage walking and improve urban sustainability (Su et al., 2019).

We aim to conduct a study on the impact of the introduction of the tramway in the new city of Ali Mendjeli in Constantine on the walkability of this urban area. The implementation of this sustainable mode of transportation has reduced car traffic and promoted the creation of outdoor amenities along its route. Our research question is as follows:

How has the installation of the tramway in the new city of Ali Mendjeli in Constantine influenced the walkability of this urban area?

3. Materials and Methods.

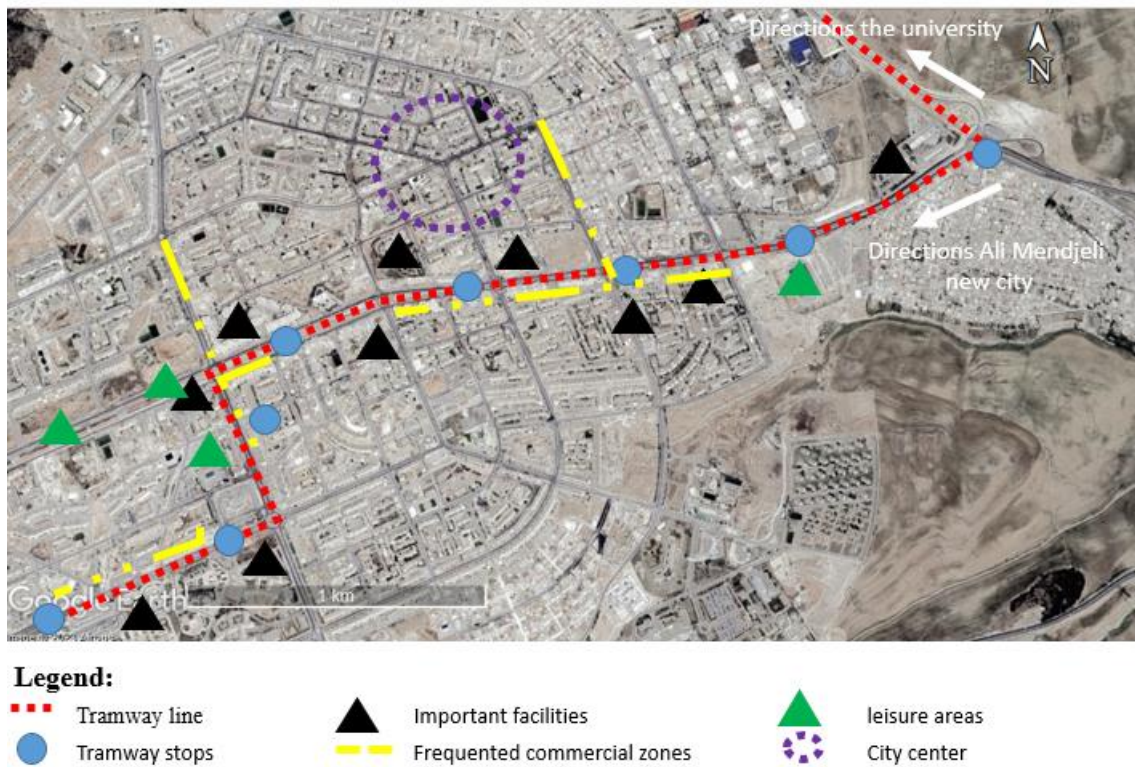
3.1 Methodology.

To obtain reliable results for our research on walkability in the new city of Ali Mendjeli, we used a mixed methodology, combining two research tools. The first tool was an online questionnaire administered to a significant number of city residents to assess their modes of transportation, travel habits, and perceptions of the safety and convenience of walking.

The second tool was on-site observation, which allowed us to evaluate the quality of sidewalks, pedestrian crossings, and signage.

3.2 Case Study.

For our research, we chose to focus on a specific section of the tram line connecting the city of Constantine to the new city of Ali Mendjeli. This section is located entirely within the new city of Ali Mendjeli and extends from the city entrance to the terminus of the tram line (see Figure 01).



*Figure 01. The tramway line in the new Ali Mendjeli city.
Source: Base map google earth 2023, Authors, May 2023.*

We selected this section based on several criteria. Firstly, it serves several important stops and neighborhoods in the new city (see figure 02), making it a significant traffic area. Additionally, the tram line follows the main artery of the city and serves the bustling commercial areas, including the presence of several shops and, notably, the Ritadj Mall.



*Figure 02. The tramway serving various neighborhoods of the Ali Mendjeli new city.
Source: Authors, March 2023.*

4. Results and Discussions.

4.1 Study Sample.

In our study, we conducted a survey among a random sample of residents in the new city of Ali Mendjeli. We distributed a total of 100 questionnaires that included questions covering three main aspects: The first aspect pertained to the respondents' personal information.

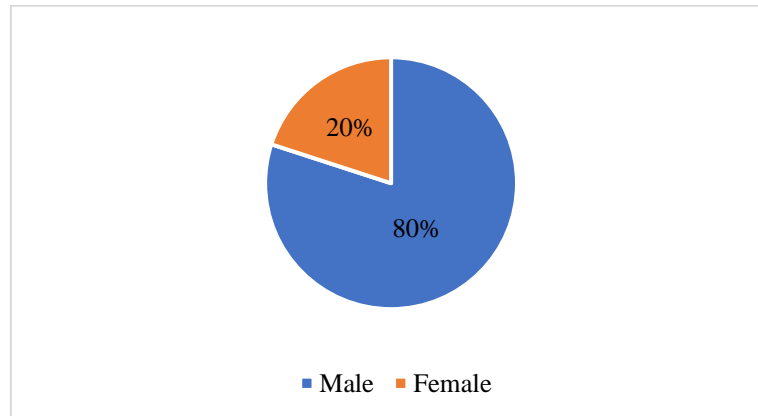
The second aspect included questions about the use of the tramway as a mode of transportation,

such as frequency of use, reasons for use, etc.

The last aspect comprised questions about the walkability of the city, including obstacles encountered while walking, pedestrian infrastructure, etc.

4.2 General Information about the Sampling.

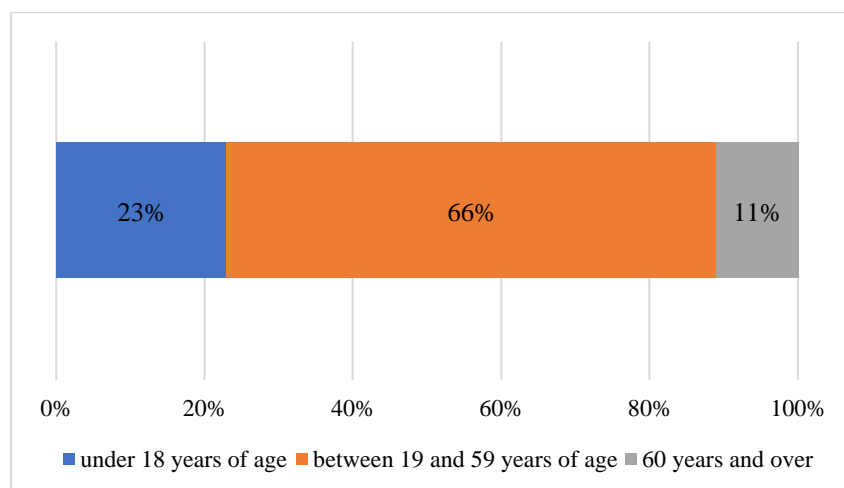
The survey conducted among the residents of the new city of Ali Mendjeli revealed that the majority of respondents regarding walkability after the arrival of the tramway were men, with a high percentage of 80% (see figure 03).



*Figure 03. The constitution of our study sample.
Source: Authors May 2023.*

This can be explained by various factors, such as men's commuting habits in the city and their relationship with public space.

Regarding the age of the respondents, it can be noted that the most represented age group was 19-59 years old, accounting for a rate of 66%. This age group is often considered the most active in the workforce and therefore more likely to use public transportation for city travel. On the other hand, individuals under the age of 18 represented a percentage of 23%, which can be attributed to the fact that they are often accompanied by their parents or legal guardians for their travel. Individuals over 60 years old accounted for a small percentage of 11% of the sample, which may suggest that they have different transportation needs or face difficulties in mobility in general (see figure 04).



*Figure 04. The age groups in our study.
Source: Authors May 2023.*

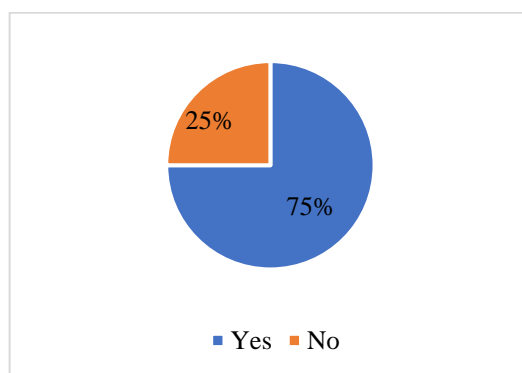
These results highlight the importance of considering the diversity of residents' profiles when planning transportation infrastructure and walkability in the city. It is crucial to ensure that the needs of all age groups and genders are taken into account to ensure inclusive and equitable mobility for all city residents.

Education level is a key factor in understanding the socio-cultural situation of a city's population. In the case of the new city of Ali Mendjeli, the survey results show that the majority of respondents (60%) have a university degree. This indicates that the city has a relatively educated population with a high level of education.

These results also suggest that the new city of Ali Mendjeli attracts educated individuals, perhaps due to employment and economic development opportunities. This may also have implications for the city's future, as an educated population is often associated with greater civic participation and better quality of life.

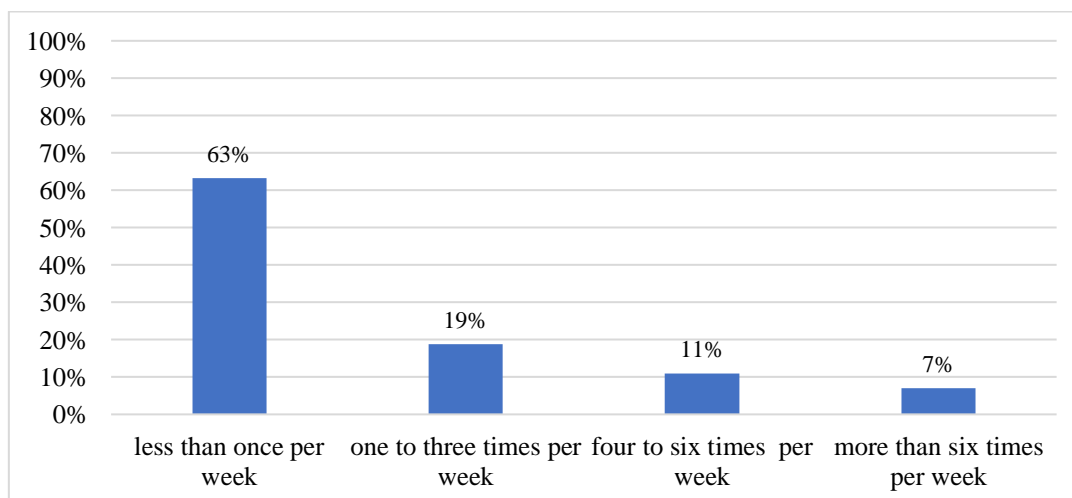
4.3 Use of the tramway for urban transportation.

The survey results show that an overwhelming majority of 75% of the respondents indicated that they use the tramway as a means of transportation for getting around the city (see figure 05). This highlights the importance of the tramway for urban travel in this city.



*Figure 05. The use of tramway for city transportation.
Source: Authors May 2023.*

However, another interesting observation revealed by this survey is that the majority (63%) of these users only take the tramway less than once a week (see figure 06). This could be due to various factors, such as the presence of other competing modes of transportation like buses or taxis, or the availability of private cars.



*Figure 06. The frequency of tramway usage by residents.
Source: Authors May 2023.*

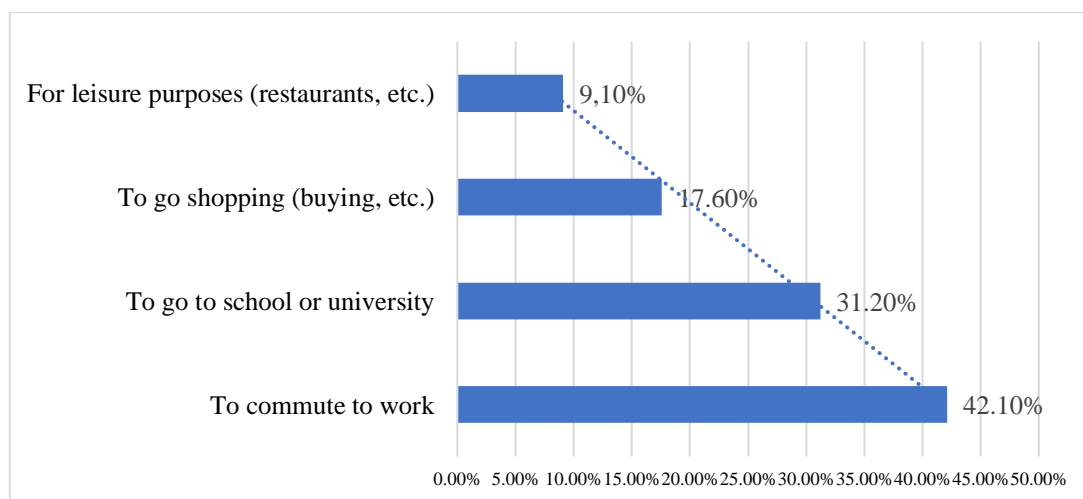
Nevertheless, it is important to note that the tramway remains a popular choice for urban travel, despite people not using it on a daily basis. This underscores the importance of continuing to improve and expand tramway services to meet the transportation needs of the local population (see figure 07).



*Figure 07. The tramway serves the most important neighborhoods and commercial areas of the city.
Source: Authors, March 2023.*

When residents were asked about their reasons for using the tramway for their urban travel, the responses varied. Some mentioned using it for commuting to work (42.10%), while others used it for going to school or university (17.6%). Others mentioned using the tramway for shopping or leisure purposes (31.20%), such as going to restaurants or other entertainment destinations (09.10%). (see figure 08)

These responses demonstrate that the tramway has become a popular and versatile mode of transportation, catering to a variety of travel needs for the city's residents.



*Figure 08. The reasons why people use the tramway.
Source: Authors May 2023.*

4.4 Walking in the new city of Ali Mendjeli.

Satisfaction with walking is an important aspect to assess the quality of life for city residents. In the case of the new city of Ali Mendjeli, the majority of respondents expressed high satisfaction with their walking experiences (see Figure 09).



*Figure 09. The satisfaction with the transportation within the city.
Source: Authors May 2023.*

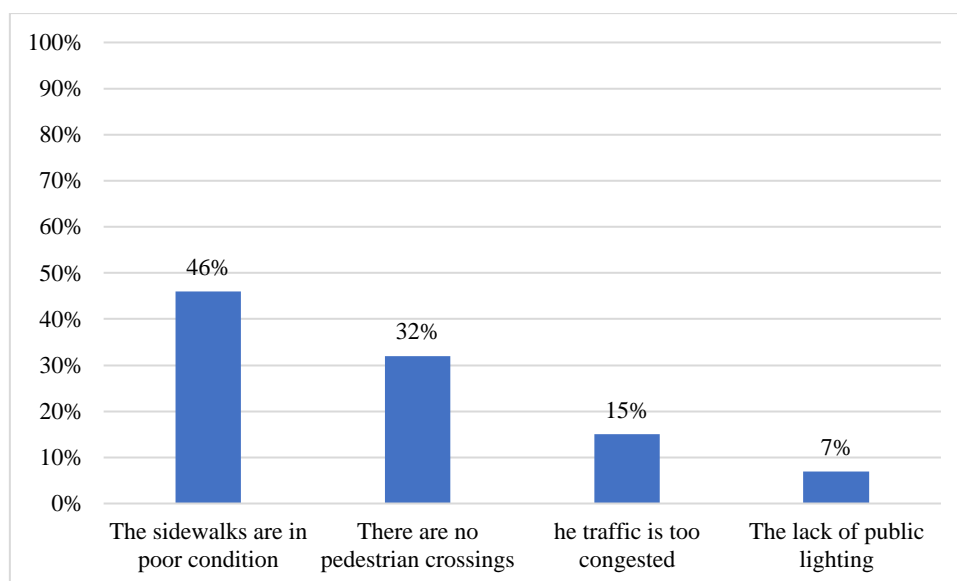
This satisfaction can largely be attributed to the urban improvements made with the arrival of the tramway. The tramway has facilitated the redesign of outdoor urban spaces, such as sidewalks, public squares, and intersections, to make them more accessible and enjoyable for walking (see Figure 10). Pedestrian areas have been expanded, vehicle lanes have been reduced, and signage has been improved, making walking experiences safer and more comfortable.



*Figure 10. Redevelopment of outdoor spaces to promote walkability.
Source: Authors May 2023.*

It is important to note that the low rate of 5% of people dissatisfied with their walking experiences may be due to individual reasons, such as health or mobility issues, or factors related to the urban environment, such as (see Figure 11):

- Poor sidewalk conditions: 46%;
- Lack of pedestrian crossings: 32%;
- Heavy traffic: 15%;
- Insufficient street lighting: 7%.



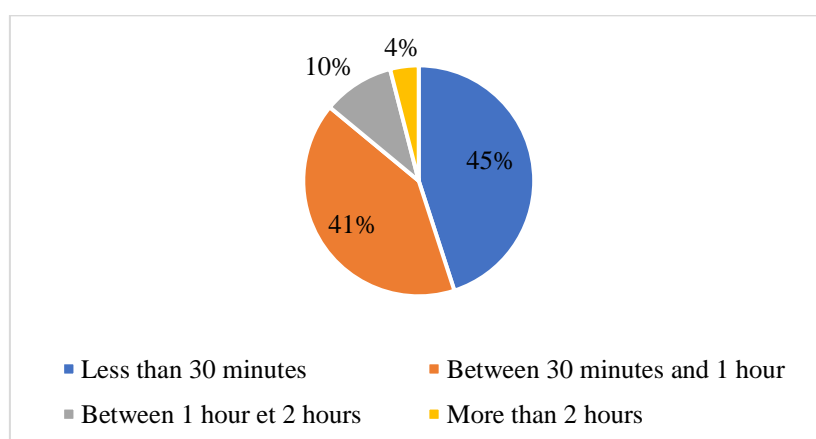
*Figure 11. The obstacles encountered during walking in the city.
Source: Authors May 2023.*

Nevertheless, the overall improvement in walkability in the new city of Ali Mendjeli, thanks to the arrival of the tramway, has had a positive impact on the satisfaction of residents with their walking experiences.

It is interesting to note that the majority of respondents (45%) when asked about the amount of time they spend walking each day, indicated that they walk less than 30 minutes. This may be attributed to the well-planned infrastructure for the tramway in the new city, allowing people to use this mode of transportation for longer distances instead of walking.

However, a certain percentage (41%) of individuals responded that they walk between 30 minutes and 1 hour per day. This could be due to their personal choice to walk for short distances instead of using public transportation, or it may be because they do not have access to convenient transportation options for certain areas.

It is also noteworthy that a small percentage of individuals (around 10%) reported walking for more than an hour per day (see Figure 12). This could be due to their personal preference for maintaining an active lifestyle or, perhaps, because they lack suitable transportation options for certain destinations.



*Figure 12. The average time spent walking on foot.
Source: Authors May 2023.*

Overall, it appears that the majority of residents in the new city of Ali Mendjeli do not need to walk much on a daily basis. However, there is still a certain percentage of individuals who walk for

more than an hour per day, indicating a variety in the transportation habits of the population.

5. Conclusion.

The study of the new city of Ali Mendjeli highlights the positive impact of the introduction of the tramway on walkability and satisfaction with walking in the city. The residents, primarily young university-educated individuals, expressed satisfaction with the use of the tramway as their primary mode of transportation. Outdoor urban spaces, such as sidewalks, have been redesigned to provide pedestrian-friendly infrastructure. The accessibility of the tramway has also reduced daily walking time for many residents. However, some residents continue to walk between 30 minutes and 1 hour per day, indicating a commitment to an active lifestyle.

The new city of Ali Mendjeli serves as an example of urban development focused on walkability and integration of public transportation. This contributes to creating an environment that promotes health, sustainable mobility, and quality of life for residents. Nevertheless, it is important to continue improving the walkability of the city while considering the needs of all residents. This requires ongoing commitment from local authorities to maintain and enhance pedestrian infrastructure, promote the use of the tramway, and create attractive public spaces for walking.

In summary, Ali Mendjeli demonstrates that an effective combination of public transportation and urban planning that prioritizes walkability can create a more sustainable, accessible, and enjoyable city for its residents, while inspiring other cities to adopt similar approaches to improve the quality of life for their residents.

Declaration of Interest Statement.

The author declare that she has no conflict of interest.

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