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TOWARDS A BETTER UNDERSTANDING OF THE REASONS FOR THE EXTENSIVE USE OF PRIVATE CARS: A CASE STUDY IN SKIKDA, ALGERIA

Summary. With the continuous urban expansion of cities around the world, cities have become more crowded as the numbers of all kinds of vehicles have increased, especially due to the inclination of individuals to use personal cars. In this study, we want to identify the different reasons that motivate the populations of the state of Skikda, Algeria, to prefer using cars through a questionnaire. In order to be clearer, we processed and analyzed the survey data using the SPSS analytical program. This article aims to identify the main reasons that motivate individuals to prefer using a personal car when traveling and propose possible solutions, or even identify actions to be taken now and in the future in order to establish a more sustainable exclusive transport. By analyzing the results, it became clear to us that road users prefer cars only for psychological and technical reasons and do not consider the preservation of the environment or the security of people. Although they are aware of the problems arising from their extensive use, they continue to do so because they have no other alternative. Improvements in public transportation means would change the situation.

1. INTRODUCTION

Transport and congestion in cities are major problems for urban development today [1]. They are the object of considerable economic, social, spatial and environmental stakes and sources of complex conflicts of interest in which all-urban actors participate [2]. Indeed, over the last 20 years, urban travel problems have become increasingly complex and acute. This is the result of the combined action of two universal phenomena: the very strong growth of urban populations in national demographics and the increasing use of urban motorized transport [3, 4].

As a result, in any part of a city, as elsewhere, the crisis of public transport, the social evolution of the inhabitants, and the need to be mobile have increased the use of private cars and other means of formal and informal transport [5, 6, 7]. These have further aggravated the problems of urban traffic, causing endless chains of congestion on a daily basis and increasingly paralyzing the economic and social life of citizens [6, 8]. Therefore, a society of "self-mobility" has emerged, whether at the symbolic, spatial, or social level. Cities reconfigured to be more accessible by car, which has led to new problems complicating the mobility of citizens [10].

According to surveys conducted in several cities across the national territory, the number of private vehicles has increased from 64,182.12 vehicles in 2018 to 6,577,188 vehicles in 2019 [9]. This unfavorable situation requires a dynamic and thoughtful reaction from authorities in order to reduce the

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volume of private car use by trying to understand and change the behaviors of different road users [11], or at least create alternatives that allow users to move to a more sustainable mode of transport [12, 13]. This requires knowledge of the different reasons and motivations [14] for the intensive use of the personal car in order to find solutions and alternatives to change the situation and reduce the attractiveness of the car or create an alternative that can compete with it [15, 16].

For this case study, we chose the city of Skikda because it is considered one of the most important Algerian cities and an important tourist and economic area. It is home to the largest oil refinery in Algeria and Africa and is affiliated with the border company Sonatrach; in addition, the city is an important commercial and strategic port [17].

Skikda also includes two industrial areas and is characterized by great agricultural activity, which has made it a city characterized by mobility and permanent urban expansion. This expansion involves a continuous increase in the ownership and use of personal cars [18].

In this work, we attempt to highlight the main reasons for the intensive use of private cars obtained from the analysis of a survey carried out among different users of private cars (PV) in urban areas of Skikda to come up with possible solutions to reduce it. It is recommended to first identify all the principal reasons for the intensive use of PV, time, type of transport means, and the problems and then identify the actions to be undertaken on a priority basis.

2. METHODOLOGY

This paper presents the advancement of an innovative approach that we have been using to solve the problem of urban transport practices in the city of Skikda. We base this process on the participation of all actors [19] and, more precisely, users who are directly implicated in the problem. Any assessment of the problems encountered in a situation is bound to fail without the participation of all relevant actors [20, 21]. This approach must be a source of continuous progress and improvement in order to face the actual situation. The success of this analysis depends on the information that will be collected in the field. Our proposed approach is to use a questionnaire distributed to users of various forms of urban transport in the city of Skikda. The use of the questionnaire as a quantifiable data collection method presents a series of questions asked in a well-defined order [22]. The questions are very basic and readable, thus ensuring that accurate and clear answers are obtained. This questionnaire contains three types of questions [23]:

- Closed-ended questions: This type of question asks participants to choose their answers from a specific list of options such as a yes/no question or a test question (experience, gender, etc.) [24].
- Open-ended questions: This type of question collects qualitative data, such as participants' opinions and beliefs. In these questions, we ask participants for their personal answers; responses to such questions tend to be objective and qualitative [25].
- Mixed (close-ended) questions: For this type of question, respondents can choose more than one answer from the provided options and also the respondents can choose another. If the respondents do not find a satisfactory answer among the options provided. These questions are used to collect the data most related to this study [26].

Responses to questions were given on a five-point Likert scale, with options ranging from 1 (low) to 5 (high) [27]. We divided the questionnaire into five main axes. The first axis is related to socio-demographic characteristics. It enquires about the different personal data of the individuals such as gender, age, income, work, place of residence, and whether or not they own a car, which gives an overview of the different characteristics of the individuals who shared their opinions. The second axis is related to daily travel. It contains different questions that show the different times during which individuals travel. The third axis is related to the mode of transportation used by individuals in their trips, whether they are secondary or primary. The fourth axis is related to user behavior. It contains the reasons that motivate individuals to use private cars instead of other means of transport. The fifth axis is related to car use. It contains the problems of extensive use of the private car in the city. These questions ask to what extent individuals are aware of the negative aspects of car usage.

The obtained information was analyzed by constructing tables and graphs. The questions were carefully considered to allow an evaluation of the state of urban transport in Skikda in order to find out the main reasons that motivate a person to use a personal car in the city.

The questionnaires were distributed, and a response rate of 93.84% [28] was achieved. This response percentage is sufficient for the current analysis (the results can be considered unreliable, biased, and of little value if the response rate is between 30% to 40%). In order to analyze the results of the questionnaire, we used the Statistical Package for Social Sciences (SPSS) program, version 20, to create tables, intersection tables, and radar charts [29]. This gave us a clear picture of the reasons for the massive use of personal cars by individuals. The results obtained from the Likert scale questionnaire were analyzed using the relative importance index RII [30], which can be calculated by Eq. (1).

$$RII = \sum_{i=1}^{n} \frac{W}{A.N} \tag{1}$$

where:

W is a constant that expresses the weight given to each cause and varies from one to five;

A is the maximum weight (equal to five in this case) [30;]

N is the total number of correspondents;

n is the number of samples.

This work is based on the use of statistical data as an effective instrument to answer research questions pertaining to "what," "how," and "why." This qualitative research aims to provide a comprehensive view and learning tool for local authorities [31] and local governments. To be successful, this approach must be part of a continuous improvement process by which we measure, act, and then observe the effects and progress. It is a systematic approach to estimating the problem by measuring and categorizing the factors that motivate road users to prefer using private cars based on the use of the relative importance index. It is also a graphical, quantified method that can help local governments prioritize and manage the dominant reasons for car use that negatively impact urban transportation.

This method allows us to know the different times during which individuals move in the city, as well as the most used means of transportation during their daily movement. This method will enable us to identify the main reasons for people's preference for the personal car over other means of transportation, as well as the problems that arise from the extensive use of personal cars. Understanding these various factors and what causes them will allow us to provide a set of solutions and recommendations to contribute to the process of continuous improvement in the urban transport system in the city. The method is illustrated in Fig. 1 below.

where:

$$ID_i = \sum_{i=1}^{4} \frac{X_i}{N} \tag{2}$$

$$IG = \sum_{i=1}^{4} \frac{ID_i}{4} \tag{3}$$

ID_i is the index of each axis;

IG is the index of the four study axes.

A rating scale has been used to obtain a readable presentation of the results [32]. The latter expresses the relative importance of the different axes of the study, where the RII changes between certain values that provide special data, as shown in Table 1.

3. DATA PRESENTATION AND ANALYSIS

3.1. Reliability of the questionnaire

Cronbach's alpha scale was used to test the reliability of the questionnaire and to determine the internal consistency of each item [33]. The results of the questionnaire are considered acceptable if the value of Cronbach's alpha is greater than 0.7 [34]. The value of Cronbach's alpha for 32 items is 0.714,

as shown in Table 2. Thus, the results of our questionnaire can be considered acceptable and can be generalized to the rest of the community.

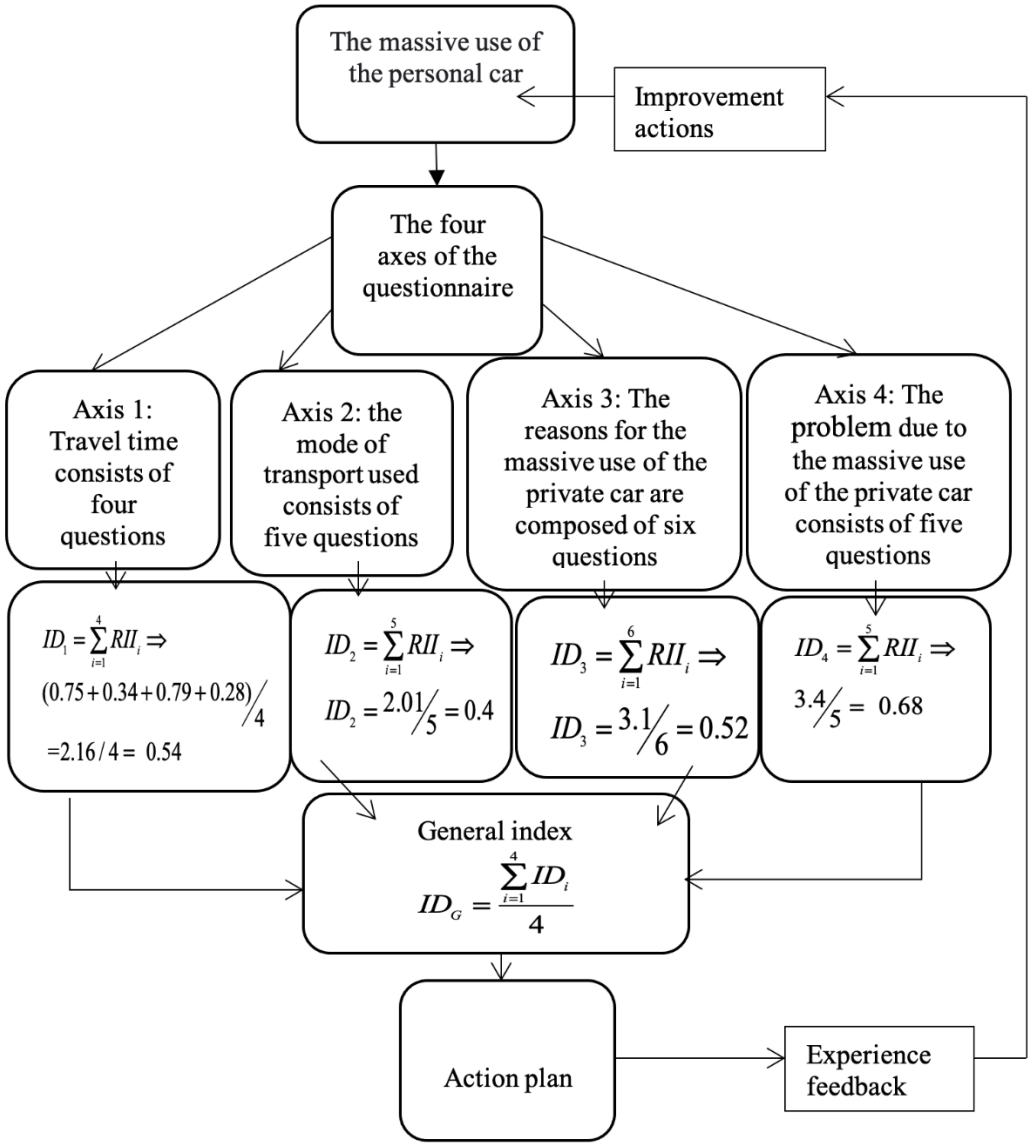

Fig. 1. Organization of the present work's methodology

Table 1

Scoring Scale

RII values	Importance level	Color
0.8≤RII≤1	High	
0.6≤RII≤0.8	High-medium	
0.4≤RII≤0.6	Medium	
0.2≤RII≤0.4	Medium-low	
0≤RII≤0.2	Low	

3.2. Respondent profiles

A survey conducted in Skikda on the use of private cars. In total, 610 questionnaires were distributed to various groups of society. Most of the respondents (80.8%) resided in the city center. The objective

was to find the point of view of this sample on transport in Skikda and determine how closely related it is to the use of private cars. Table 3 below shows the main characteristics of the sample.

Table 2

Cronbach's Alpha for the study axes

Reliability statistics	
Cronbach's Alpha	Number of elements
0,714	32

Table 3

Main characteristics of the sample

Respondent profiles	Information
Sex	67% male and 33% female
Age	32.6% under 30 years, 67.4% between 30 and 40 years
Employment	65.2% employed
Education Level	6% no education, 27.3% high school or less, 66.7% university level
Income	29.3% between 35,000 and 45 000 DA, 28.4% between 25,000 and 35,000 DA
Residence	80.8% Skikda city center

3.3. Main reasons for using private cars and public transportation

Radar charts used that are easy to read and interpret for better data analysis. The initial phase consists of identifying the main reasons for private car use, as shown in Fig. 2.

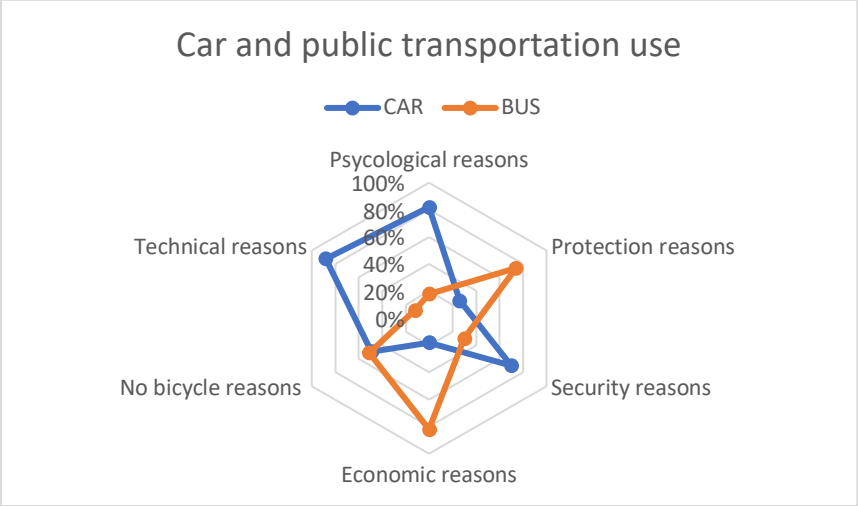

Fig. 2. Various main reasons for using a personal car

It is clear that the choice of a private car in the city of Skikda is due to psychological reasons (comfort, freedom, independence, and the habit of using it on a daily basis) rather than technical reasons (speed and the need to arrive on time). As for the other reasons, which are very important (economic reasons, environmental protection, lack of bicycle facilities, safety reasons), were not considered strong reasons that encourage individuals to use personal cars. This is due to the lack of culture regarding the use of roads and means of transport by individuals. Thus, awareness campaigns are needed.

Therefore, it can be said that individuals do not use private cars only for technical reasons; in most cases, individuals use them as part of their daily routines because see them as an opportunity to move

comfortably away from the noise of public transport. Try to reduce, even a little, the use of the personal car. Knowing the reasons for the intensive use of the car in the city of Skikda has opened up many possibilities for improving the situation.

This study also allowed us to detect the times during which most people's trips are made, as well as the means of transport used by the sample during their main daily trips (i.e., for work or school) and during their secondary trips (e.g., for entertainment or shopping). The results of the fourth axis allowed us to prioritize the problems posed by the extensive use of private cars based on the opinions of the respondents to see if they were satisfied with the state of urban mobility and the control of the private car over most other types of road traffic.

4. RESULTS AND DISCUSSION

4.1. Assessment of individuals' daily travel times

The importance index for each of the sample members' travel times clarifies that most members travel in the morning (RII=0.75) and evening (RII=0.79), while their travel during the rest of the day (noon and night) is low (RII=0.34 and RII=0.28). It is the subject to the law of "peak demand," characterized by high mobility during the morning-evening peak hours, depending on the nature of their trips (work/study/shopping) Fig. 3.

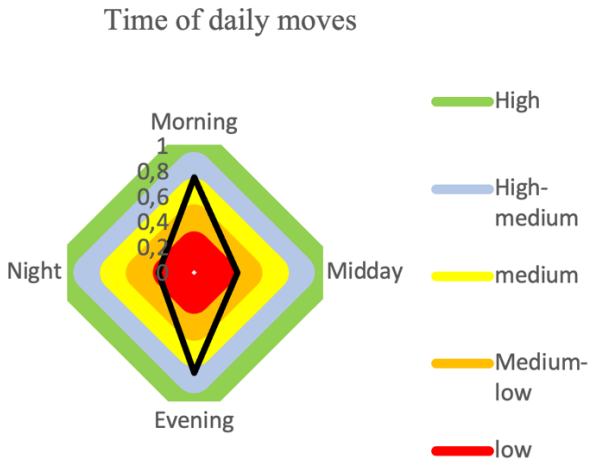

Fig. 3. Time of daily moves

The radar graph shows that travel in the city often occurs in the morning and evening. During the change of work and study hours, it is not necessary that all individuals, including workers and teachers, leave at 8:00 a.m. and return home at 5:00 p.m., which is a dangerous situation that must be reviewed by the competent authorities, as far as teachers are concerned, by providing them with school transportation. It is not necessary for parents to use their cars to take their children home. Providing restaurants at educational institutions and workplaces offers the opportunity to reduce the use of cars and various forms of transportation, as well as to provide transportation for workers. It is difficult to change the culture of the movement of individuals within societies and influence government authorities. Such change will require the cooperation of all parts of society.

4.2. Assessment of transport for primary and secondary trips

Daily transport means are numerous and varied (e.g., bus, private car, taxi, informal car, walking). Each individual has a specific pattern for getting to his or her destination, whether for primary (work or school) or secondary (shopping, hiking, visiting relatives) trips. The means of transportation used for primary and secondary trips were compared; the responses are classified as follows.

For primary trips, the sample preferred to use private cars (RII=0.66), followed by the bus (RII= 0.49), and other means of transport with varying degrees of use (collective car (RII=0.30), informal car and walking (RII=0.28) (Fig. 4).

However, the pattern differed for secondary daily trips. The importance indicator shows that individuals' mobility interests were spread across all modes of transport because they were not constrained by time. Secondary transport is only an add-on (Fig. 5).

According to this axis, the results of the choice of transportation means of individuals during their secondary trips can be adopted as an ideal reference for these trips because we noticed that individuals use various transportation means, including personal cars, almost equally. This is a good situation for an ideal urban trip, but individuals, during secondary trips, are not obliged to arrive on time, making these trips more pleasant. However, during primary trips, time plays a primary role in the choice of private cars, which is the fastest means of transport. This, when comparing the selection of private cars by individuals for their main daily trips, is due to technical reasons (speed). From this, it is possible to raise the general index of our study by increasing the efficiency of public transport so that it becomes faster, larger, and more comfortable, thus making it a more suitable alternative to the car and making for a better urban situation. The use of private cars can be reduced during people's secondary trips under the slogan of car-free streets, free time, and weekends, thus encouraging society to move towards more sustainable means of transportation, such as walking and cycling, during non-work and study periods.

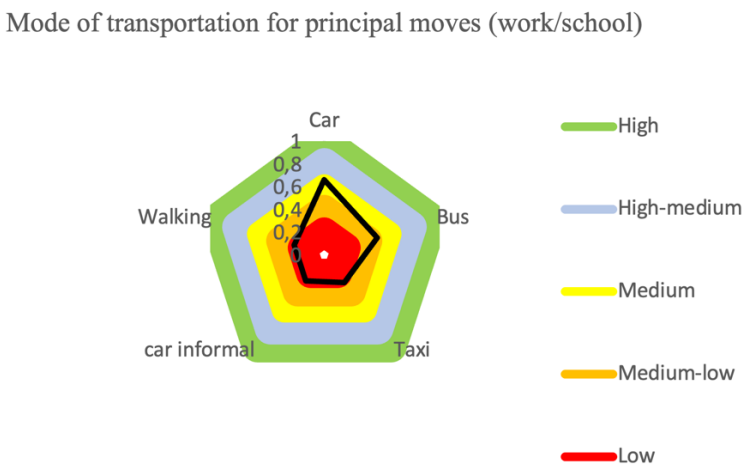

Fig. 4. Choice of mode transportation for primary trips

4.3. Assessment of the reasons for using personal cars and public transport

Most of the respondents preferred to use a personal car for several reasons.

4.3.1. Private car

When we asked respondents about their reasons for using a private car, we obtained the following results:

- Psychological reasons (RII=0.88)
- Technical reasons that facilitate travel (speed and arrival on time; RII=0.61).
- Economic and safety reasons (RII=0.38).
- Environmental protection reasons (RII=0.24) (Fig. 6).

The situation is very dangerous. As mentioned earlier, the relative importance index shows that people's preference for private cars is due to psychological reasons in the first place and technical reasons in the second [35, 36]. The idea that individuals use personal cars only for psychological and technical reasons is dangerous because neglecting their safety on the roads and protecting the environment from pollution and congestion resulting from intensive car use is a serious matter and

requires the intervention of imposing charges according to the amount of car pollution and imposing charges on car fuel and designated car parking spaces.

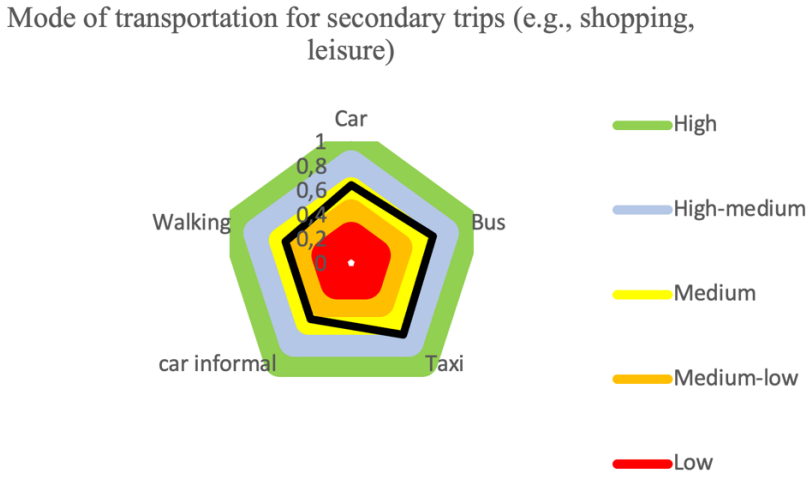

Fig. 5. Choice of mode transportation for secondary trips

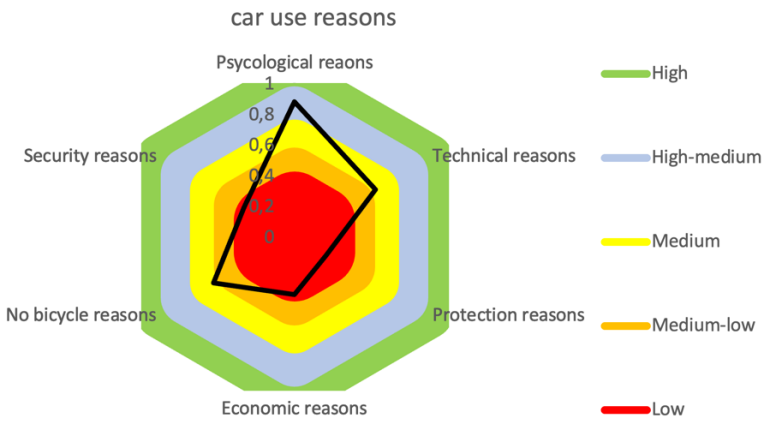

Fig. 6. Reasons for personal car use

The authorities must take strict measures against individuals who use their cars indiscriminately without considering the right of nature or the health of individuals, in addition to the safety index and traffic accidents on the roads.

4.3.2. Public transport

From the Comparison between the reasons why individuals choose public transport or private cars. Fig. 7 shows that economic reasons are the main motivation for using public transportation (RII=0.70). Individuals who use a personal car due to the absence of bicycle facilities have an importance index of (RII=0.61), and individuals who use public transportation due to the absence of bicycle facilities are represented by an importance index of (RII=0.77) (a common point of use personal car and public transport).

Most people choose to travel by public transport only because it is cheaper than buying a car, and this is unfair to them. A person with a low or medium pension who cannot afford a car has the right to travel in comfort. Improvements can be made by increasing the efficiency of public transport by better organizing it, renewing it, and improving its quality[37]. Most users of public transport and private cars indicated that if bicycle facilities were available in the city, they would be more likely to travel by

bicycle. This is a good thing and would be a simple solution to reduce the use of private cars on the city streets.

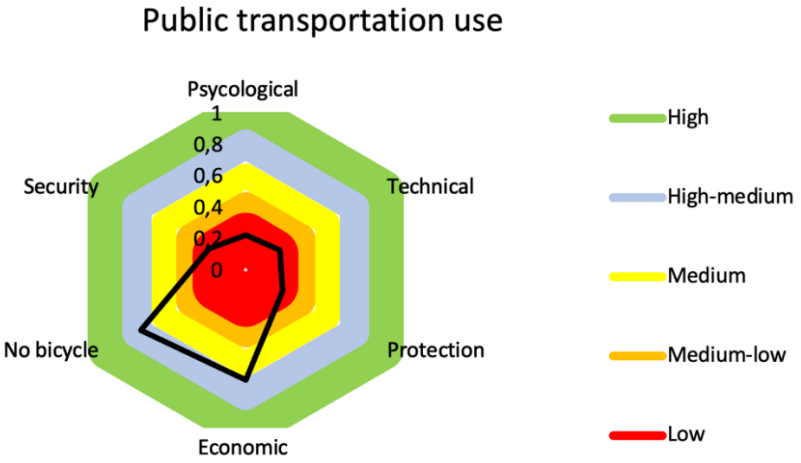

Fig. 7. Reasons for public transport use

4.4. Issues related to the massive use of personal cars

Despite the awareness of the respondents of the problems related to the intensive use of personal cars [38] , it remains their preferred means of transport. From Fig. 8, it is clear that most of the respondents are aware that cars cause congestion (RII=0.83), pollution (RII=0.53), and energy consumption (RII=0.68). Participants also understand that private car use causes accidents (RII=0.63) and affects the standard of living of individuals through increased expenses (RII=0.65).

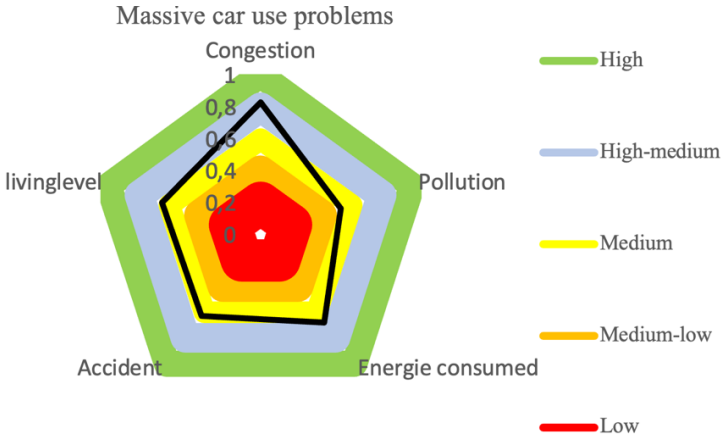

Fig. 8. Characterization of the issues surrounding the massive use of private cars

The results of the fourth axis clarify that most individuals are fully aware of the dangers of the intensive use of private cars on city streets and consider it a cause of traffic congestion. Simply exploiting all previous recommendations and looking for broader solutions to reduce car use will reduce these risks, thus promoting a more sustainable urban center and improving the overall indicator of our study.

5. CONCLUSION AND RECOMMANDATIONS

The analysis shows that most people travel in the morning and evening period and that the main means of travel is the private car, while other means of transport are rarely used. This situation is detrimental to the whole community. It creates many problems in urban areas, primarily the problem of traffic congestion, as well as other problems such as environmental pollution, traffic accidents, energy

consumption, and the impact on the standard of living of individuals through increased expenses for fuel and maintenance, for instance. Individuals prefer to use personal cars for psychological reasons, including comfort, independence, and freedom. They also consider it a manifestation of wellbeing. It is also used for technical reasons; specifically, traveling by car is faster than using mass transportation available in the state.

Here, the role of awareness of the need to reduce the use of personal cars is necessary in order to move toward more sustainable urban transport. Moreover, this method is part of a continuous improvement approach by which people measure, act, and observe the results and improvements. The study has identified the main reasons why individuals choose to travel by personal car, trying to shed light on raising the quality and efficiency of mass transportation to become an alternative and preferred mode of transportation by individuals.

Therefore, for the problems arising from the intensive use of the car to be reduced, cities should have fewer cars and promote advanced public transportation. Unfortunately, time is needed to create an advanced public transportation system in the city, and this makes it difficult to make people move away slightly from their cars, and movement problems will remain until the situation is improved by competent authorities. We conclude with a set of recommendations that the concerned authorities should make efforts to improve the effectiveness of public transportation in order to draw users to them by developing public transport in terms of both quantity and quality, which is the key to fixing the car ownership phenomenon.

Quantity relates to the development of the number of buses, while quality relates to the speed increase, the development of comfort, increase the capacity of buses and increase their ability to carry people, and the regulation of bus arrival and departure times at their respective stations. When we can provide public transport more sustainable, this will provide safety and cost the occasion and time component, comfort and pleasure of travel, especially punctuality and the cleanliness of the environment. Promoting and encouraging high-capacity transport (subway, trams). Regarding the use of intelligent transport systems, the various media and transportation communication technologies are intended to assist in vehicle operation and location determination to facilitate traffic flow.

Global positioning systems can be used to monitor traffic via traffic lights, and it is one of the most significant devices. It is a geo-positioning device. Traffic control and traffic light monitoring. Good organization of the times work of the different means of public transport by the good organization of their travel times.

A group of buses driving behind each other regularly and occasionally is known as bus rapid transit. The first experience was in Latin America. It had a dedicated route that should be worked from to reduce the intensive use of private cars in urban areas.

Awareness campaigns such as the distribution of materials and flyers that encourage individuals to be aware of the dangers of heavy car use and to help improve the situation. Furthermore, the concerned authorities should increase the tax for parking by specifying a certain period, and the state should work to gradually reduce fuel subsidies.

Also, people who own a car should try not to use it when traveling short distances and should walk instead, which is healthy. People should also drive calmly and obey traffic rules, turn off their cars when they have to wait in traffic jams, and, if they want to buy a new car, they should select an environmentally friendly car. people should also try to carpool. If a person plans to move, they should consider a neighborhood close to their workplace.

From this study it is recommanded that the transportation situation in the city will change as soon as possible. Any developed city needs a sustainable urban transport system.

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