International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 07 Issue 06 June 2024
DOI: 10.47191/ijcsrr/V7-i6-27, Impact Factor: 7.943
IJCSRR @ 2024
www.ijcsrr.org

Evaluation of Travel Time and Cost Burden for Working: A Case Study of Jalalabad City, Nangarhar, Afghanistan

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ABSTRACT: Evaluating travel time and cost burden for working in Jalalabad city is one of the key challenges for employees to use their modes of transportation for working place and as well as to examine the travel time difficulties encountered by those traveling to work in Jalalabad city. The everyday commute in urban areas has a substantial influence on the overall quality of life as a whole with longer travel times and congestion putting a strain on commuters' fulfilment, efficiency, and happiness. Understanding and properly measuring these are critical for politicians and urban planners when developing successful transportation systems and policies. To meet the goals, multiple methods for estimating trip times were used, including survey-based techniques. To gather data on travel behaviors and trip times, declared preference questionnaires and indicated preference surveys were undertaken. The research investigated the average commute time and expense for several professional subjects and places, providing light on the differences in challenges faced by persons in various sectors. In addition, the overall average trip time and cost for various means of transportation were investigated to determine the effectiveness and affordability of every choice. The study's findings add to the current research by focusing on Jalalabad city, Nangarhar and evaluating commute time burdens for work in the city. This small study wants to improve Jalalabad's transit system and employees' well-being by identifying suitable modes of transportation for commuters and important variables impacting these burdens and suggesting feasible solutions. The findings give useful insights for politicians and urban planners in developing specific programs to reduce commuter travel time barriers.

KEYWORDS: Commute, Employee, Estimation, Mode of Transportation, Travel Time, Travel Cost.

1. INTRODUCTION

1.1. Background

Economic growth across developed regions and difficulties in building new infrastructures have led to the need for accurate monitoring of the conditions of present transportation systems and the development of new strategies to regulate the increase in traffic demand (Skabardonis & Geroliminis, 2005). Employees, workers, market labor, and travelers' access are provided by effective transport networks. Calculating trip time for commuters is necessary for the study of current situations and evaluations for possible changes (Burd et al., 2021).

Therefore, substantial study is necessary to understand the aspects involved, such as transportation modes, distances, congestion, and social and economic features (Schwanen & Dijst, 2002). So in this study, we trying to estimate travel time and cost burden for working in Jalalabad business city, Afghanistan. Jalalabad is the capital of Nangarhar province and more than 70 % of its population lives In rural areas and burdens time and cost while traveling to working place (Singh, 2008). This burden refers to the time spent traveling from living place to working place, reducing efficiency and the standard of life (Zhao & Wan, 2021). Through carrying out a case study and gathering initial information using a questionnaire survey approach, this study aims to estimate the burden of commute time in the city of Jalalabad and provide managers and policy-makers with suggestions for improving the transport system and providing workers with enough services to save enough time and money (Wang et al., 2014).

The study's goal is to determine the typical commute time and costs burden for working in Jalalabad city, considering different forms of transportation and locations. The study recommends adding to the existing ways of mobility by conducting a questionnaire survey and analyzing the information gathered for better comprehension. The findings will help policymakers, transportation developers, and other essential parties build plans by identifying the most affordable and practical modes of transportation for employees. The objectives of this research were to determine the average commute time and costs for working in Jalalabad city,

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considering different forms of transportation and locations. The report recommends that to improve the present means of transportation.

1.2. Travel Time

Identifying travel time faced by people through their regular work commute is an important aspect of evaluating the travel time burden in Jalalabad city, Nangarhar. The amount of time people spend traveling from their house to their place of employment and back is referred to as travel time. It takes into account the time required for individuals to cross the distance between these two locations using the different modes of transport available in the city.

In urban areas like Jalalabad city, travel times might vary significantly depending on a variety of circumstances. The distance between the house and the workplace, the method of transportation, and the level of traffic at the time are among the aforementioned considerations.

1.3. Mode of Transportation

Individuals' modes of transportation for regular job commutes are an important aspect in determining the travel time burden in Jalalabad city, Nangarhar. Various considerations, such as comfort, availability, price, and individual preferences, might impact the method of transportation chosen. In Jalalabad city employees chose the following modes of transportation for traveling to their everyday working place (foot, taxi, own car, Rickshaw, bicycle, Motorcycle). The primary data have been collected based on the above modes of transportation through questionnaires interviewing with employees in Jalalabad city, Nangarhar.

2. LITERATURE REVIEW

The everyday trip to work has a considerable influence on the general standard of life for those who live in cities. Those who commute confront difficulties such as extended commute times and traffic jams, which harm their work efficiency, and happiness. Authorities and urban designers require knowledge about assessing the burden of traveling time to establish successful transportation policies. This literature review evaluates prior studies on assessing work travel time burdens, with a particular focus on the case study of Jalalabad city, Nangarhar, Afghanistan.

The result of a study was to estimate travel time for one side route in the United States and compare them to the previous years. The average travel time was 33.2 minutes and 2.62 minutes was increased (Burd et al., 2021). A study was conducted to determine the worth of the duration of travel spent on working trips throughout the city of Calicut. The investigation found that the duration of the trip and money had a significant impact on the value of travel times. The value of time rises in tandem with rising income. In the same way, travel time also positively affects VOT (Athira et al., 2016). The study was to examine how deep neural networks may be utilized to forecast both the time and duration of taxi trips. A model was provided to calculate the path time between origins and destination GPS points, then integrates these calculations using the time of days to predict travel times (Schwanen & Dijst, 2002).

The phrase "travel time burden" describes the detrimental effects that long commutes and the stress they cause have on commuters. Studies have repeatedly shown that long commutes negatively impact commuters, leading to higher stress levels, worse work satisfaction, and lower productivity (Bharvsar, 2020). These effects not only have an influence on the person but also on the economy and society at large.

Understanding the travel time burden requires accurate trip time estimation. Researchers have employed a range of techniques, from conventional survey methods to cutting-edge technology like GPS and cell phone data. To collect information on travel behaviors and trip durations, conventional survey-based methods including stated preference surveys and stated preference surveys have become frequently used (Chen, 2016). Additionally, technological developments have made it possible to utilize GPS and cell phone data to predict journey times more precisely and in real time (Hong, 2020).

The daily increasing traffic and the congestion on the roads are two major challenges for the Advanced Traveler Information System, causing difficulty in calculating and predicting the travel time (Wang et al., 2014). The results of the research suggest that urban form plays a significant role in determining travel time and cost. Compact urban forms with shorter distances between destinations tend to result in lower travel times and costs. On the other hand, sprawling urban forms with longer distances between destinations lead to higher travel times and costs (Frank et al., 2008). Focuses on evaluating the effects of urban-rural integration projects on the amount of time and money inhabitants of Beijing's rural and suburban districts must spend traveling. The goal of the study is to

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comprehend how different land use patterns affect commuters' access. Researchers hope to get insights into the efficacy of laws intended to lessen the strain of travel for locals by assessing these measures (Zhao & Wan, 2021).

Transportation studies have traditionally concentrated on calculating the burden of commuting time for employment. Travel time burden is the perceived hardship or suffering that people experience as a result of the time spent traveling to and from their jobs. Numerous studies have been carried out to better comprehend the factors that affect the burden of travel time and its effects on people and communities. One research, for instance, looked into the relationship between travel time and happiness. Longer travel times have been linked to higher stress levels, more intense work satisfaction, and worse life satisfaction overall. Additionally, researchers have looked into a variety of methods for measuring journey time burden.

3. MATERIALS AND METHODS

3.1 Methodology

The method used in this research consists of a variety of procedures intended for gathering and analyzing relevant data from respondents.

To start with, a well-organized questionnaire has been developed to enable an accurate and organized collection of data. The questionnaire was particularly designed to extract data relevant to the respondents' common method of transportation for working, which involved alternatives such as private automobiles, public transit, or walking. Additionally, the questionnaire included information regarding the distance and route between the homes of the respondents and their jobs.

Investigators went to several sites where the respondents lived and worked to gather the necessary data. They provided particular printed forms for data collection. Participants were required to carefully complete these documents, providing exact and extensive facts regarding their commute schedules. (Gong, 2017).

3.2 Data Collection

The data was gathered through questionnaires from 410 workers based on simple size calculation, by considering various modes of transportation. To calculate the travel time and financial burden of employment, a significant amount of data is required. It was important to interview workers and travelers for the study, which necessitated acquiring first-hand information. In the context of workers' business journeys, workplace interview techniques were utilized to collect data from employees depending on their mode of transportation (from their place of residence to their place of employment). Only work-related travel was taken into consideration because it is typical and customary for many employees to commute to their place of employment and may inspire them to change their mode of transportation. Participants also had to offer answers for each set of options to provide specific information on trip time (Singh, 2008).

Creating questionnaires is a necessary step for surveying to interview workers. The questionnaire consists of two parts, in the first step we will gather individual characteristics like (age, income, living place, working place, and occupation). In the second step we consider their mode of transportation to working place (foot, taxi, bicycle, Motorcycle and private car), the collection of travel characteristics adopts the survey technique based on travel activities to note the departure time, arrival time, start point, end point, travel mode, travel cost and other information for each trip.

3.3 Data Analysis

We are required to get pertinent data regarding Jalalabad's travel patterns by incorporating questions about transportation in our questionnaire survey. This information will benefit our study by giving us a full understanding of how city dwellers move about. We may make use of this data to develop effective transport plans, enhance environmentally friendly travel, and raise Jalalabad's standard of living in general.

The initial step in the quantitative evaluation procedure is to organize and clean up the data. This involves identifying and fixing any errors, outliers, or missing crucial variables that might affect the accuracy of the study. The data is ready for statistical analysis after it has been cleaned up and placed into an Excel sheet. The data was examined using a variety of statistical techniques to find hidden patterns.

An overview of the data and its characteristics was given through descriptive statistics, which also includes trend and dispersion measurements. The findings provide and describe the dataset's main aspects. Additionally, based on the sample data, inductive

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statistical methods were used to construct findings and make conclusions about the population. This is accomplished through hypothesis validation, in which statistical evaluations are used to detect significant variations or correlations among factors.

4. RESULTS AND DISCUSSIONS

The study's findings concentrated on measuring the commute time burden for working in Jalalabad city, Nangarhar, Afghanistan. The entire time and cost for each individual were examined, as were the average time and cost for various fields, as well as the average time and cost for various means of transportation. The findings provide light on the travel habits and burdens that various workers in the city faced. The following table 4.1 is the summary of the socioeconomic and travel characteristics of the 410 respondents.

Table 4.1: Summary of travel characteristics

Parameters	Category	Percentage %
Marital status	Married	60.2
	Unmarried	39.8
Age (year)	< 20	16.3
	20 to 30	35.6
	30 to 40	25.8
	40 to 50	18.5
	> 50	3.8
Monthly income (AFN)	< 10,000	13.4
	10,000 to 15,000	32.7
	15,000 to 20,000	24.3
	20,000 to 30,000	15.8
	30,000 to 40,000	11.2
	> 40,000	2.6
Job Sector	Government	32.7
	Private	67.3
Mode of Trip	Walk	0.7
	Bicycle	7.6
	Motorcycle	15.9
	Taxi	34.1
	Rickshaw	33.9
	Own Car	7.8
Distance (Km)	< 5	0.8
	5 to 10	25.7
	10 to 20	40.1
	20 to 30	19.6
	30 to 40	11.5
	> 40	2.3

410 participants were approached to take part in the survey during the study, and each one was asked to answer questions about socioeconomic status and travel habits, their most recent trips taken on a typical workday, and then to choose another choice for a business trip. According to the early analysis, men make up all 410 respondents.

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For work travel, 34.1% of the people chose taxis, and 33.9% selected three-wheelers. It has been shown that 40.1% of work travels are between 10 and 20 km in distance. Nevertheless, in this model, 67.3% of the respondents were private employees 32.7% of the surveyed were government employees, and 35.6% of the participants were 20 to 30 years old.

4.1 Average Travel Time and Cost through Transportation

The research also analyzed the average time and cost associated with various means of transportation in Jalalabad city. The table 4.2 below presents the average time (minute) and cost (AFN) for each mode of transportation.

Table 4.2: Average Travel Time and Cost through Transportation

Mode of Transportation	Average Travel Time (Min)	Average Travel Cost (AFN)	Percentage %
By foot	10.4	0	0.7
By own car	35.2	120.0	7.8
By bicycle	24.9	18.6	7.6
By motorcycle	34.5	47.2	15.9
By rickshaw	30.0	21.9	33.9
By taxi	47.4	53.9	34.1

The analysis of this study shows that average travel time by taxi is 47.4 minutes and average cost 53.9 AFN out of 410 respondents. Commuters' burden 30 minutes and 21.9 AFN for commuting to their working place by Rickshaw, and also by Motorcycle 34.5 minutes and 47.2 AFN, by own car 35.2 minutes and 120 AFN.

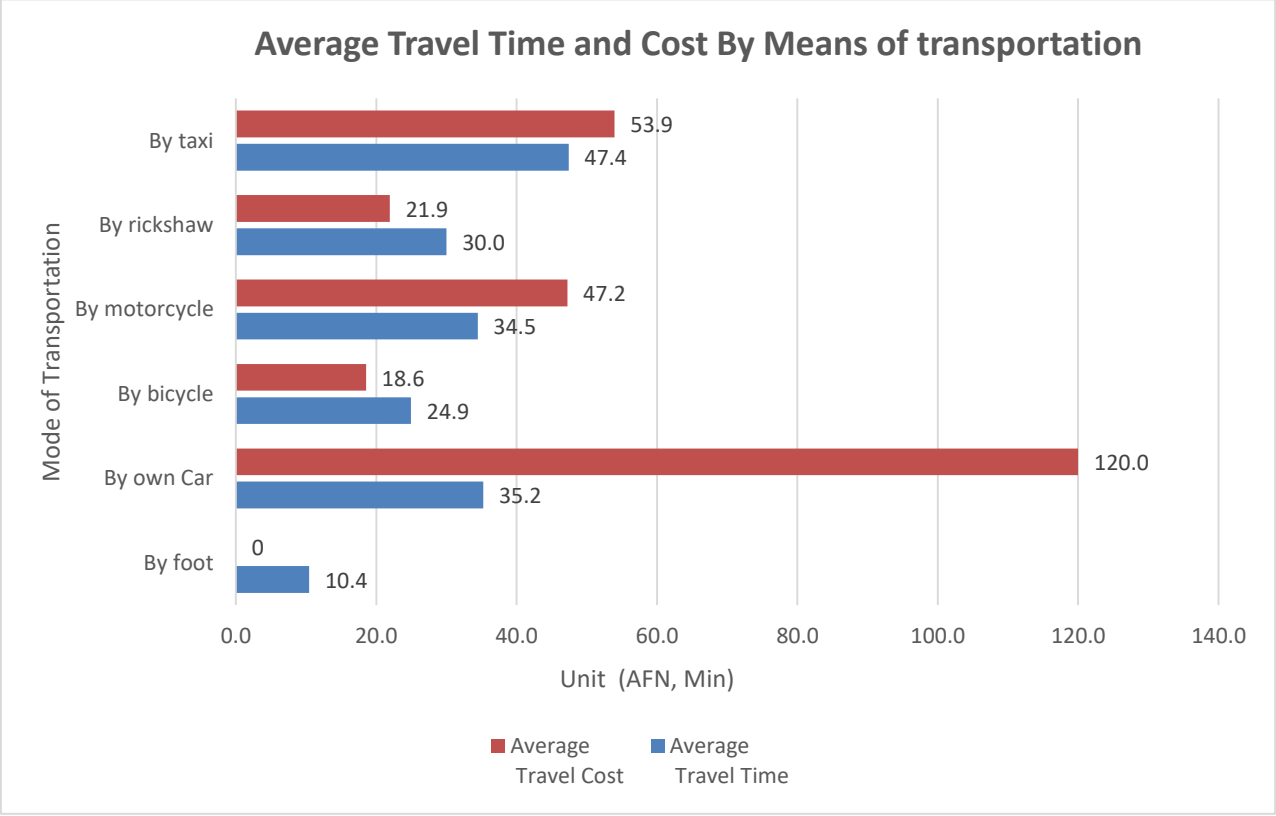

Figure 4.1: Average Travel Time and Cost By Means Of Transportation

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The results of this study show that average journey time and cost differs between modes of transportation. It implies that those who use one mode of transportation may have longer commutes and greater transportation costs than others. Distance, routes availability, and method of transport may taken role in these variations.

The above figure 4.1 shows the differences in travel time and cost across Jalalabad's various means of transportation. It has been discovered that traveling by foot takes the most time and least money, but driving your own automobile takes the least amount of time and the most money.

4.2. Percentage of Respondent for Different Fields

In this model we also found the numbers, average income and percentage of responses for different fields of employee in Jalalabad city. The following table 4.3 and chart present the number, percentage and income of different employees shown in figure 4.2.

In all of the models, the most important factors are commute time, travel cost, personal income, and occupation. However, the importance of personal income and employment is lowered with journey distance. In this model 71 responses was gained from shopkeepers out of 410 responses which made 20.7% percent of the total percentage and their average income was 13889 AFN. 35 responses was made by clerk 8% of the total percentage and their average income was 9600 AFN, and so on for other fields as well.

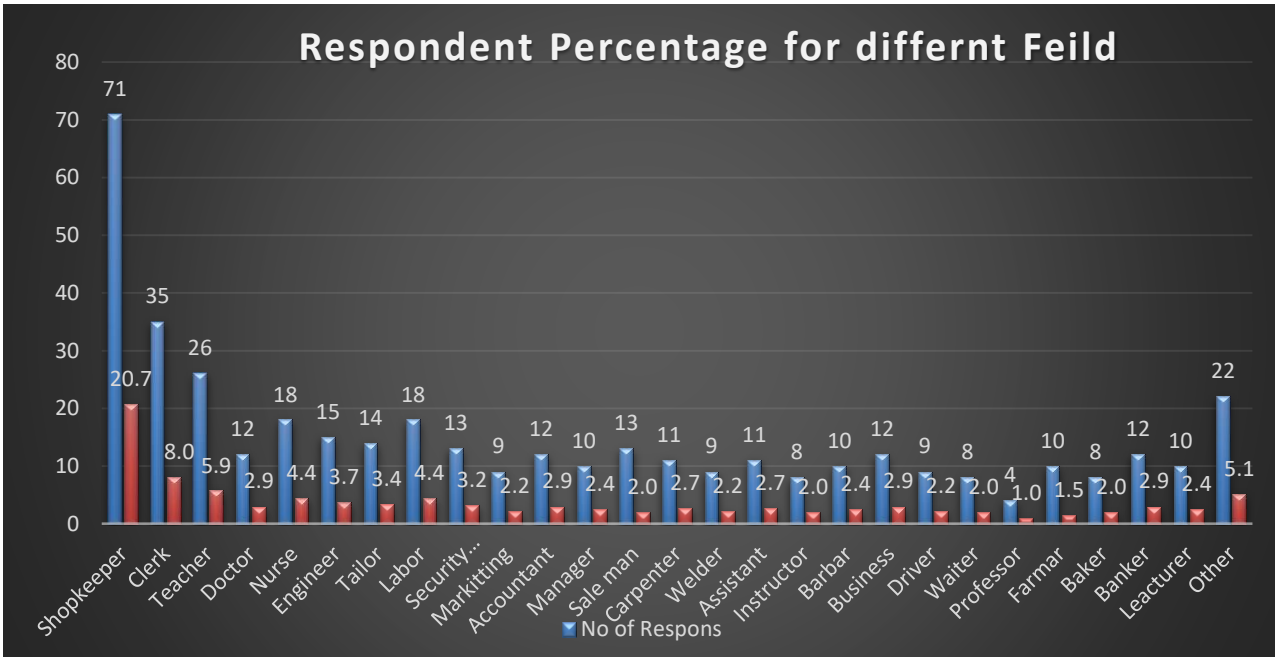

Figure 4.2: Percentage of Responses

4.3. Travel Time and Cost Burden for Work in Different Locations

The differences in average commute time and cost among various locations and professions suggest that certain vocations might require longer commutes and greater transportation costs. The table 4.3 elaborates the travel time and cost burden for working in Jalalabad city for different locations by considering various modes of transportation. If an employee lives in Daronta and works in Jalalabad city the distance between this location is 12 Km, and chooses a taxi mode for traveling to working place burden of 40 minutes on average time and 30 AFN on average cost. By Rickshaw 45 minutes average time and 20 AFN cost, by own car 30 minutes average time and 90 AFN cost, by motorcycle 30 Minutes and 40 AFN cost, by bicycle 55 minutes average time and 20 AF. For other locations details are elaborated in the table 4.3 as well.

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Table 4.3: Travel Time and Cost Burden for Working to Different Locations, By Considering Modes of Transportation

Employee Location				By Foot	By Own Car		By Bicycle		By Motorcycle		By Rickshaw		By Taxi	
No	Living Place	Working Place	Distance (Km)	Time (min)	Time (min)	Cost (AFN)	Time (min)	Cost (AFN)	Time (min)	Cost (AFN)	Time (min)	Cost (AFN)	Time (min)	Cost (AFN)
1	Daronta	Jalalabad city	12	-	30	90	55	20	30	40	45	20	40	30
2	Daronta	Dosaraka	6	40	15	50	25	10	12	30	25	10	20	10
3	Daronta	Chiknawri	9	65	22	60	35	15	20	30	35	20	30	20
4	Hijrat Kali	Jalalabad city	15	-	40	110	60	20	40	50	55	30	50	30
5	Hijrat Kali	Dosaraka	8	60	20	60	35	10	15	30	25	20	25	20
6	Hijrat Kali	Daronta	4	25	-	-	10	10	5	20	10	10	8	10
7	Dosaraka	Jalalabad city	7	50	20	50	30	10	15	30	25	10	25	20
8	Dosaraka	Chiknawri	5	30	-	-	10	10	5	29	15	10	12	10
9	Dosaraka	Surkhrod	8	-	20	60	40	20	20	40	25	20	25	20
10	Surkhrod	Jalalabad city	13	-	35	80	55	20	30	50	45	30	40	30
11	Surkhrod	Chiknawri	10	-	25	50	45	10	25	40	35	20	30	20
12	Shairzad	Jalalabad city	26	-	55	130	-	-	55	70	-	-	65	80
13	Shairzad	Dosaraka	22	-	50	120	-	-	50	60	60	40	55	60
14	Shairzad	Surkhrod	15	-	25	60	55	20	25	40	35	30	30	30
15	Chiknawri	Jalalabad city	5	25	-	-	12	10	8	30	15	10	10	10
16	Hesarak	Jalalabad city	28	-	60	140	-	-	55	80	-	-	70	100
17	Hesarak	Dosaraka	24	-	55	130	-	-	50	60	-	-	60	90
18	Hesarak	Surkhrod	16	-	40	120	60	20	40	50	50	20	45	30
19	Kakrak	Jalalabad city	25	-	55	130	-	-	50	60	-	-	60	40
20	Kakrak	Dosaraka	20	-	50	120	-	-	45	50	-	-	55	40
21	Kakrak	Surkhrod	12	-	35	90	50	20	35	50	45	20	40	30
22	Khalis Fameli	Jalalabad city	8	60	20	50	35	10	20	30	25	20	25	20
23	Khalis Fameli	Angorbagh	5	30	-	-	20	10	10	30	15	10	12	10
24	Angorbagh	Jalalabad city	4	25	-	-	15	10	8	20	12	10	10	10
25	Chaparhar	Jalalabad city	34	-	65	150	-	-	-	-	-	-	70	120

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26	Saracha	Jalalabad city	10	-	30	80	45	20	30	40	40	20	35	40
27	Saracha	Gomrak	8	-	-	-	-	-	-	-	35	20	30	30
28	Gomrak	Jalalabad city	5	30	-	-	20	10	10	20	15	10	12	20
29	Markoo	Jalalabad city	22	-	45	130	-	-	45	60	-	-	50	70
30	Markoo	Gomrak	18	-	40	120	-	-	40	50	-	-	45	50
31	Kama	Jalalabad city	37	-	65	160	-	-	60	80	-	-	75	100
32	Kama	Bilandghar	30	-	55	140	-	-	50	70	-	-	65	80
33	Tangi	Jalalabad city	16	-	45	120	-	-	40	50	55	30	50	40
34	Khiwa	Jalalabad city	36	-	65	150	-	-	55	70	-	-	75	100
35	Darah Noor	Jalalabad city	44	-	75	200	-	-	65	100	-	-	90	150
36	Behsood	Jalalabad city	9	-	25	60	40	20	20	40	30	20	25	30
37	Biland Ghar	Jalalabad city	8	-	25	60	40	20	20	40	30	20	25	30
38	Jamali	Jalalabad city	12	-	30	80	55	20	30	40	-	-	30	30
39	Tamirat	Jalalabad city	5	30	-	-	15	10	10	30	12	10	-	-
40	Dihwalid	Dosaraka	13	-	35	60	60	20	30	40	-	-	40	30
41	Dihwalid	Jalalabad city	17	-	40	80	-	-	35	50	55	30	50	40
42	Meeran	Jalalabad city	6	40	-	-	25	10	15	30	20	10	15	20
43	Nazarabad	Dosaraka	6	40	-	-	25	10	15	30	20	10	12	10
44	Maidan	Jalalabad city	4	25	-	-	15	10	10	20	12	10	-	-
45	Shikh Mesri	Dosaraka	10	-	25	50	45	20	20	40	35	20	30	30
46	Rodat	Jalalabad city	42	-	65	170	-	-	60	80	-	-	75	100
47	Rodat	Markoo	13		25	80	45	10	20	40	-	-	30	30
48	Qasaba	Jalalabad city	4	25	-	-	10	10	5	20	15	10	-	-
49	Khalis Fameli	Jalalabad city	12	-	25	70	45	20	20	40	30	20	25	30
50	Gambiri	Jalalabad city	16	-	30	70	-	-	30	40	40	30	35	40

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5. CONCLUSION

Based on the findings, the study evaluated the travel time and cost burden for working in Jalalabad city and provides light on the commute time challenges come across by people in Jalalabad city, Nangarhar, Afghanistan, and gives useful insights for policy-makers, urban designers and suitable mode of transportation for employees. The differences in average commute time and cost among various locations and professions suggest that certain vocations might require longer commutes and greater transportation costs. This data may be used to better understand the unique issues that professionals in various industries experience and to customize movement plans to meet those demands. The findings also emphasize the need to consider various means of transportation when calculating travel time burdens. The large difference in average time and cost between walking and driving implies that personal automobiles contribute to longer commuting times and higher costs. This research emphasizes the need of supporting other modes of transport, such as public buses or bicycles, to relieve commuting burdens and decrease traffic jams in the city.

Finally, this study gives significant details on the commute time difficulties faced by employees in Jalalabad, Nangarhar, Afghanistan. The differences in average time and cost among location and professional sectors illustrate the necessity for personalized movement plans to handle the unique constraints that different jobs meet. Furthermore, the examination of various modes of transportation emphasizes the significance of encouraging efficient and inexpensive alternatives, such as public transit systems, to reduce travel time constraints and improve the overall commute experience in the city. The results of the study might be used by lawmakers and urban designers to establish effective movement solutions that increase the health and efficiency of Jalalabad employees.

6. SUGGESTIONS AND RECOMMENDATIONS

Improving Transportation Infrastructure: Invest in constructing and maintaining roads and bridges to reduce travel time and costs. This includes expanding road networks, implementing traffic management, and ensuring regular maintenance.

Enhancing the Public Transportation System: Modernize public transportation options like buses and shuttles. Focus on increasing the frequency, reliability, and coverage of public transport to provide affordable and efficient alternatives to private vehicles.

Promoting Sustainable Modes of Transportation: Encourage environmentally friendly transportation such as cycling, walking, and carpooling. Implement necessary infrastructure like bike lanes and pedestrian paths to support these modes, reducing congestion and environmental impact.

Improved Productivity and Quality of Life: Emphasize that reducing travel burdens enhances employee productivity and quality of life. Minimizing commute times and costs allows workers to better allocate time and resources, leading to higher job satisfaction and well-being.

7. ACKNOWLEDGMENT

I would like to extend my sincere appreciation to my esteemed supervisor, Dr. Rashid Rehan, the Director of NIUIP, UET Peshawar, for his unwavering encouragement and motivation during the course of this study. My gratitude also goes out to all the dedicated faculty members of the National Institute of Urban Infrastructure Planning (NIUIP) at the University of Engineering and Technology (UET) Peshawar for their invaluable support and assistance throughout the completion of this research. Additionally, I am grateful for the close collaboration with the Research and Development Department of Alfalah University in Jalalabad, Afghanistan, which greatly contributed to the success of this endeavour.

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Cite this Article: Mohammad Yasir Amin, Mohammad Mukhlis Behsoodi, Ghunchagul Bahar, Samsoor Pasarlay (2024). Evaluation of Travel Time and Cost Burden for Working: A Case Study of Jalalabad City, Nangarhar, Afghanistan. International Journal of Current Science Research and Review, 7(6), 3783-3792