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PERCEPTIONS TOWARDS SUSTAINABILITY OF ROADS IN PAKISTAN: A CASE STUDY OF FAISALABAD CITY

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ABSTRACT

The unplanned growth of private vehicles and massive urbanization increased the associated problems of the road network in Faisalabad city. The present research investigates whether Faisalabad city is moving towards or away from sustainability with respect to road infrastructure, local traffic load conditions and prevailing accidents, socio-economic conditions of people, public perceptions and environmental health. Primary data was collected from 56 congested points of the city along with some secondary data from different authentic sources. The sample size was 500 and a convenient sampling technique was utilized. Frequency distribution and cross tabulation were applied by using Statistical Package for Social Sciences (SPSS). The general public of Faisalabad city was not satisfied with the existing public service system. They were unsatisfied with the traffic engineering and management. The people of Faisalabad city were facing socio-economic problems and environmental degradation. This research will contribute to solve issues of the road network and associated problems and suggest measures to make the road network sustainable in Faisalabad city.

KEYWORDS: Sustainability, Factor Analysis, Road network, Road infrastructure, Faisalabad

1. INTRODUCTION

Urban clusters depend on a strong and sustained road network along with efficient mobility means(Garcia et al., 2020). Urbanization and motor vehicles are growing very fast in big cities of the world and demanding a strong road infrastructure (Wu et al., 2020). A strong road network provides better integration and escalates economic growth (Lee et al., 2020). The social concerns of people demand a sustainable road network (Canitez et al., 2020). The means of transport are reinforced by increasing the number of vehicles -cars, and motorbikes along with infrastructure capacities (Turoń & Kubik, 2020). Development rates, lifestyle changes, population growth and financial prosperity are providing the base for increased per capita car numbers (Elhorst et al., 2020; Erdogan, 2020). All counties around the globe are expecting to observe continuous growth in per capita vehicle ownership though the rates are expecting low in Africa

and Asia (Jing et al., 2020). The cities in China observe 10 to 25% growth in per capita vehicle numbers annually (Liu et al., 2020).

The economic growth framework of Pakistan looks to the placement of Pakistan on a sustainable higher economic path by taking steps to reduce the cost of business, improve investment in climate and strengthen institutes (Jawaad & Zafar, 2020). Transport, road network and trade hold the key positions for the achievement of the economic framework (Alam et al., 2020). The transport sector shares 10% of the total GDP along with a 6% employment provider throughout the country (Triana et al., 2013). In this capacity road network infrastructure plays an important role as the transport activities are directly linked to it (Kouser & Subhan, 2020). Moreover, this sector plays a significant role in linking other sectors responsible for boosting the economy and thus contributes directly or indirectly to domestic as well as international trade (X. Wang et al., 2020). However, the present urban road conditions are inefficient and possess real constraints on the economy with a loss of 4 to 6% of GDP (Papanek, 2020). Implementation of these principles for sustainable transport along with road networks has come to be highly important in Faisalabad, which has an inefficient and inappropriate public transport system and infrastructure. Individual incomes have motivated the persons' demand for mobility by increased use and ownership of automobiles (Aurangzaib et al., 2020). Rising motorization along with insufficient road network, traffic management policies and strategies, ill-maintained and aging automobile stock and inappropriate utilization of land together with wastage of other resources escort to a momentous traffic level and overcrowding resulting in prolonged travel times, extra consumption of fuel with elevated levels of air and noise pollution that deteriorates sustainable urban development (Gkiotsalitis & Cats, 2020).

Faisalabad is an industrial city with a network of major and minor roads connecting each other. Samundri road, Satiana road, Canal road and Jaranwala road connect Samundri, Tandlianwala, khurrianwala and Jaranwala with the CBD of the city. Jhang road, Aminpur road, Sargodha road, Millat road and Shiekhupura road connect Pansora, Aminpur, the M3 motorway and Deputy Wala with Faisalabad city. Many intra-city roads connect each side of the city. The increased urban and economic growth in Faisalabad has put a lot of stress on travel demands (Javed & Qureshi, 2019). Travel demand has quickly increased the vehicle pressure on roadway infrastructure with a massive volume. The number of registered vehicles and cars were grown to twice last year. Moreover, the rapid rise in personal vehicle ownership has led to enormous congestion, especially in the central part of the city which increases the average commute travel time in Faisalabad (Rahman Farooqi et al., 2017).

Thomas Malthus who was a great philosopher and economist hypothesized a theory that betterment in the quality of life instigates masses that would increase in subsistence means (Pullen, 2021). Sustainable infrastructure is considered an outlook of sustainable development in the transport sector (Boltze, 2020). Studies have emphasized the need for developing a sustainable road network along with a detailed policy framework to attain sustainable goals to address air and noise pollution, congestion and accidents simultaneously justify the demands of future accessibility and mobility by undermining the negative face (Song et al., 2020). Besides, the lack of social indicators/aspects due to inadequate knowledge and unsuitable research methods for evaluating the impacts of urban infrastructure on the urban population results in incorrect findings (C. Wang et al., 2020).

A developed road network is essential for a good transportation system (Viljoen & Joubert, 2018). It has a significant share in the economies of developing and developed countries (J. Wang et al., 2020). In the USA 1150 billion dollars is devoted to transportation products and services. Canada is also highly dependent upon the transport sector (Mishra et al., 2020). In the long run, people see transportation as bringing ease to their lives (Verlinghieri & Schwanen, 2020). Thus improvements in the quality of life in poor urban areas sustain political influence (Porru et al., 2020). Transport attains the political paradigm in developing countries. Hence public transportation is not just a technical issue but also a people dimension and a political stunt too (Jerzak & Libgober, 2020). It is a known fact that road networks and public transport incorporate human, social and economic issues (Mottee et al., 2020).

Road networks and public transport are not wholly considered social and poverty issues at present (Vecchio et al., 2020). These issues might be overcome by educating the people and public-private partnerships in the road network and transport services (Huang et al., 2020). Access to affordable transport offers a way out of social, economic and physical isolation (Karner et al., 2020). Modes of urban are trains, light rails, buses and mini-buses along with Para-transit modes such as rickshaws, bicycles, motorcycles; and taxis can also be included in public transport modes (Siraj et al., 2020). A Road network is considered a base to establish a feasible and approachable transportation system (Sayyadi & Awasthi, 2020). The upgrading and building of new infrastructures are necessary for the long run of existing traveling patterns (Sun et al., 2020).

The present research is focusing on the sustainability of the urban road network in Faisalabad, Pakistan. The need for transportation and road network is bigger as the labor force is headed towards the industry especially textile (the number one labor opportunity providing industry in

Pakistan). Considering these aspects the current study is designed to evaluate the sustainability of road network development, available infrastructural systems and ongoing infrastructure projects and policies in Faisalabad city. The research studied the vulnerability of road accidents and their spatial distribution. Public perceptions were identified to evaluate the sustainability of roads. The assessment strives for the identification of the direction of the existing paradigm *i.e.* towards or away from the sustainable road network.

2. MATERIAL AND METHODS

Our research is primarily based on primary data collected through questionnaires. However, secondary data was also utilized to fulfil the requirement of this research. Secondary data was collected from different departments of the city of Faisalabad. The pre-existing data on the number and nature of vehicles was obtained from the City Traffic Police, and Excise department. The accident data was obtained from Rescue 1122 and City Traffic Police Faisalabad. The data on the city road planning and expansion of the city was accessed from the Traffic Engineering and Planning Agency (TEPA) Faisalabad, City District Government Faisalabad (CDGF) and Faisalabad Development Authority (FDA).

Road network data was collected from the Traffic Engineering & Transport Planning Agency (TEPA), Faisalabad Development Authority (FDA), Punjab Bureau of Statistics, and City District Government of Faisalabad (CDGF). The roads of Faisalabad city were in a one-way traffic direction. City Traffic Police Faisalabad divided the city into 14 traffic sectors each sector consisted of a major road, along with several secondary and tertiary roads. The existing road network of the city was evaluated concerning traffic sectors. The edges and nodes were observed concerning the traffic sector area. Road network analysis was applied to find out the nodes and edges of the Faisalabad city roads. The length, width and statistical data of roads were obtained from Provincial Highway Division in Faisalabad. The capacity and associated factors of sustainability of the existing road network were observed.

The data on auto-rickshaw was collected from Excise Department, Faisalabad. A survey was conducted to collect data on motorcycle rickshaws. For this purpose interviews of the stand, managers were conducted at the rickshaw stands on different roads of the city. The data of the slow movies (Donkey carts) was collected by counting them on all the major roads of Faisalabad city. For this purpose, a survey was conducted to count the Donkey carts on the major roads of the city.

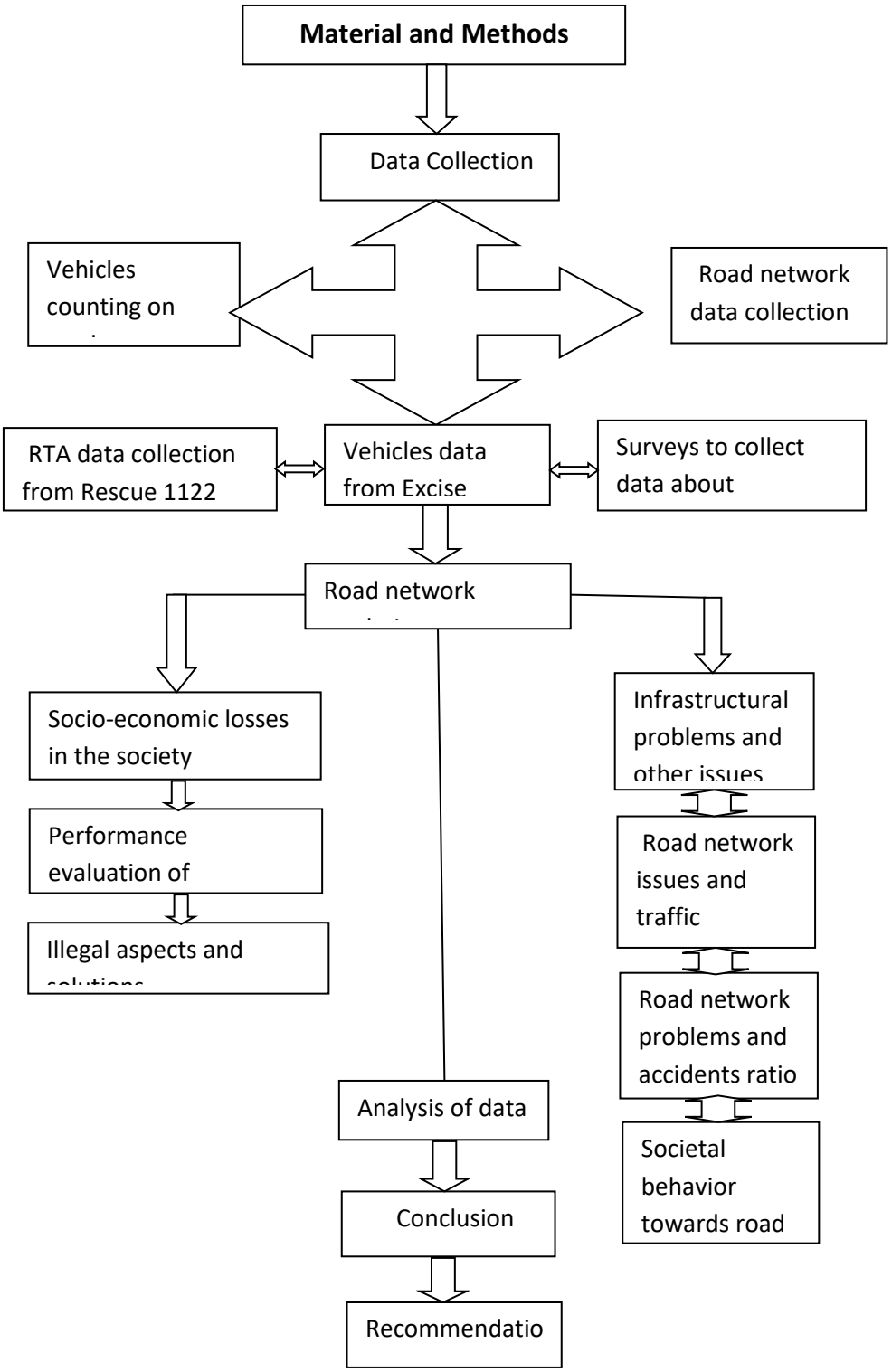

Fig.1. Schematic Diagram of

A structured questionnaire was designed to see the public perceptions of the sustainability of road infrastructure in Faisalabad city. There were 500 respondents, randomly selected from all the sectors to check out the people's behavior towards infrastructure failure and traffic congestion. A convenient sampling technique was used. A survey was also conducted to observe the sustainability of road networks based on socio-economic and environmental conditions in the city. Statistical Package for Social Sciences (SPSS) was utilized for frequency distribution and cross-tabulation.

3. RESULTS AND DISCUSSIONS

Road network sustainability is directly linked to public safety and their socio-economic well-being. Figure 2 shows the road network nodes and junctions in the road network of Faisalabad city. The concentration of road nodes can be seen in the city center of the city which is also called the clock tower. The eight bazaars with adjoining intersections circulate all the bazaars at the middle point of each entry and exit bazaar. The Kachehry bazaar, Chiniot bazaar, Bhowana bazaar and Karkhana bazaar were declared as entry bazaars and Rail bazaar, Montgomery Bazaar and Aminpur bazaar were declared as exit bazaars by the district government of Faisalabad. Jhang bazaar is the only bazaar that was not observed in a one-way direction. Each bazaar was opened on the main road forming an intersection. These intersections were joined with nodes and intersections.

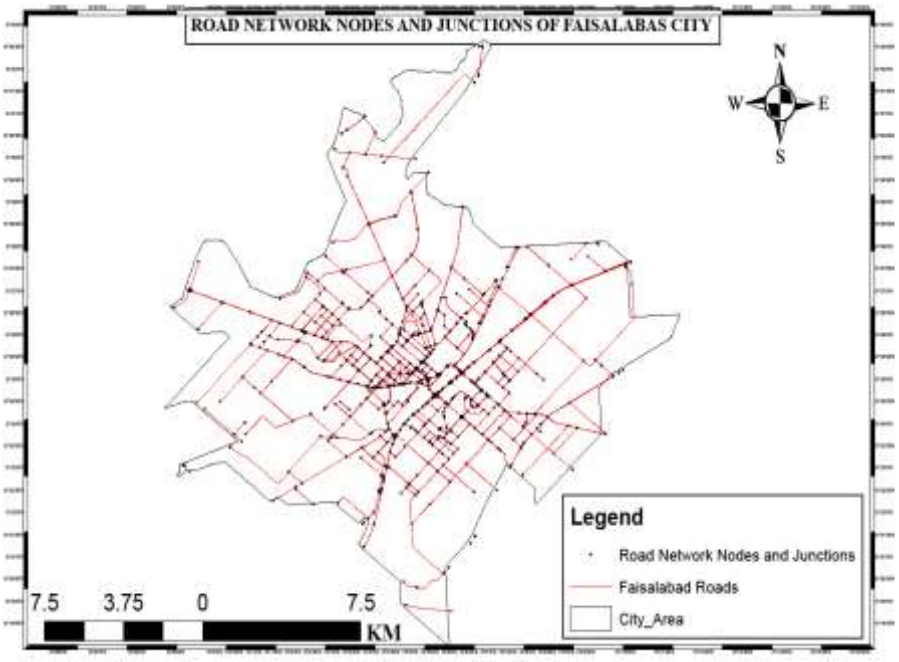

Fig. 2. Road Network Nodes and Junctions of Faisalabad City

The questionnaire completion status data table showed that 82.6% of questionnaires were completed by the respondents while 6.8% were partly completed and 10.6% of questionnaires were refused by the respondents. Table 1 shows the percentage distribution of questionnaire completion. 82.6 % of questionnaires were completed whereas 10.9 % of respondents refused and 6.8 % of questionnaires were partially completed.

Table 1: Percentage Distribution of Questionnaire Completion in Faisalabad City

Status	Frequency	Percentage (%)
Completed	413	82.6
Partially completed	34	6.8
Refused	53	10.6
Total	500	100.0

Table 2 shows that 34.6 percent of respondents belonged to the rural area and 54.6 percent of respondents belonged to the urban area. Most of the respondents belonged to urban areas. Significantly, 26.8% of respondents were aged from 18-25, 30% of respondents were aged from 26-45, 25.4% were 46-60 years of age and 7.2% were above 61 years of age. It was concluded that 1.2% of respondents were Illiterate, 6.6% were Middle, 26.2% were matriculated, 28.6% were Intermediate, 19.6% were Graduate and 7.2% were postgraduate and above. 33.8% of respondents were government employees, 28.4% were private job holders and 27.2% had their own business. To know the road safety and awareness level of the general public, their participation in a seminar/walk/first aid was asked. Most of the respondents (54.8%) did not attend any kind of seminar/walk/first. The participation ratios of respondents in traffic education, first aid, traffic awareness and rescue awareness were 10%, 10%, 11.4% and 3.2% respectively. Most of the respondents (40.2%) were using motorbikes as travel means while 15% of respondents were using cars, 23.2% were using public transport, only 3.6% were using a bicycle or by foot and 7.4%, respondents were traveling by vehicle sharing with some friend or relative. Thus the results showed that most of the respondents belonged to the urban area, and the respondents aged 26-45 years were the most.

Table 2: Characteristics of Respondents in Faisalabad

Particulars	Characteristics	Frequency and Percentage
Gender	Male	394 (78.8%)
	Female	53 (10.6%)
Area	Rural	173 (34.6%)

	Urban	274 (54.8%)
Age	18-25	134 (26.8%)
	26-45	150 (30.0%)
	46-60	127 (25.4%)
	61 and Above	36 (7.2%)
Education	Illiterate	6 (1.2%)
	Middle	33 (6.6%)
	Matriculation	131 (26.2%)
	Intermediate	143 (28.6%)
	Graduate	98 (19.6%)
	Post Graduate and Above	36 (7.2%)
Job Sector	Government Employee	169 (33.8%)
	Business	136 (27.2%)
	Private Job	142 (28.4%)
Participation in Seminar/ Walk/ First Aid Course	Yes	173 (34.6%)
	No	274 (54.8%)
Type of Seminar/ Walk/ First Aid Course	Traffic Education	50 (10.0%)
	First Aid	50 (10.0%)
	Traffic Awareness	57 (11.4%)
	Rescue Awareness	16 (3.2%)
Means of Travel	Motorcycle	201 (40.2%)
	Car	75 (15.0%)
	Public Transport	116 (23.2%)
	By Foot/ Bicycle	18 (3.6%)
	Sharing	37 (7.4%)

Table 3 shows that 45% of the respondents disagreed and only 24.8% agreed that the condition of roads is satisfactory in Faisalabad city. Poor maintenance of roads is another problem that suffers the general public. Mouratidis (2020) Found that maintenance of roads is the key factor to maintain the sustainability of road infrastructure and other issues associated with roads. Notably, 54% of respondents were of the view that poor maintenance of roads suffers the general public in Faisalabad city. Only 7.8% of respondents disagreed with the statement. Significantly, 55% of respondents agreed and 19.4% disagreed with the statement that the existing road network has many flaws, potholes, cracking and other damages in Faisalabad city. Most of the respondents (81%) were of the view that patching and potholes repair was not sustainable and could be a waste of resources.

Klopfenstein et al. (2020) found that late repair of longitudinal and transverse defects of roads was not sustainable but early repair work and patching were durable. About 0.4% of respondents disagreed with the statement. The renewal of layering was considered sustainable by most of the respondents. The renewal of the top layer of defected roads was found sustainable (Poongodi et al., 2020). Regarding road management, 17.6% of respondents agreed and 49.2% of respondents disagreed with the statement that the main holes on the roads were properly managed by the city district government of the city. Perception about repair work was that 63.8% of respondents agreed with the statement and 12.6% disagreed with the statement that the maintenance and repair work on the road was inevitable for a smooth flow in Faisalabad city and 73.6% of respondents agreed and 8.2% disagreed with the statement that road repair work is essential at the main roads of Faisalabad of city.

Table 3: Public Perception towards Existing Roads of Faisalabad

Question	Response				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
The condition of roads is satisfactory in Faisalabad city	33 (6.6%)	192 (38.4%)	64 (12.8%)	124 (24.8%)	0
Poor maintenance of roads suffers general public in the city	0	39 (7.8%)	104 (20.8%)	186 (37.2%)	84 (16.8%)
The existing road network has many flaws -potholes, cracking and other damages	32 (6.4%)	65 (13.0%)	41 (8.2%)	95 (19.0%)	180 (36.0%)
Patching and pothole repair is not sustainable and can be a waste of resources	0	2 (0.4%)	6 (1.2%)	372 (74.4%)	33 (6.6%)
Main holes on the roads are properly managed by the city district government in the city	43 (8.6%)	203 (40.6%)	79 (15.8%)	86 (17.2%)	2 (0.4%)

The maintenance and repair work on the road is inevitable for smooth flow		0	63 (12.6%)	31	(6.2%)	273 (54.6%)	46	(9.2%)
Road repair work is essential on the main roads of Faisalabad city	41	(8.2%)	0	4	(0.8%)	216 (43.2%)	152 (30.4%)	

Conclusively, it is evident from the data acquired from different traffic sectors of Faisalabad have various infrastructural problems including slow speed construction and repair works near Kashmir pull and Kashmir road, improper construction in the center of carriageway possess a potential threat for road users, illegal or unnecessary u-turns on Jaranwala road, Jhumra Road, Stiyana road, Samundri road, etc. Public perception showed that the road condition was quite unsatisfactory and required immediate corrective actions from the concerned government departments. Most of the respondents were unsatisfied with the road conditions of Faisalabad city. The major roads of Faisalabad city have cracking, potholes and other damages. A significant proportion of respondents were of the view that repair of cracking and potholes were not sustainable because of their durability and were considered the wastage of resources. On the other hand, the renewal of the layer was found sustainable as it was durable and long-lasting. The main holes of the roads were not managed properly by the concerned departments. Proper management of main holes along with the maintenance of repair work was considered inevitable for the smooth flow of traffic in the city.

Table 4 shows that 47.8% of respondents agreed and 29.8% of respondents disagreed with the statement that the road network infrastructure of Faisalabad city meets the needs of the people. Moreover, 40.4% of respondents agreed and 41.4% of respondents disagreed with the statement that city people are fully aware of road use rules.

Table 4: Perceptions toward Road Infrastructure Sustainability of Faisalabad City

Question	**Response**				
	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
	Frequency (%)	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**

Road network infrastructure meets the needs of the people of Faisalabad	69 (13.8%)	80 (16.0%)	25 (5.0%)	158 (31.6%)	81 (16.2%)
City people are fully aware of roads rules	2 (0.4%)	205 (41.0%)	4 (0.8%)	163 (32.6%)	39 (7.8%)

Table 5 shows perceptions toward public transport system sustainability. 66.2% of respondents were with the view that an efficient public transport system is needed of the time in Faisalabad while 8% of respondents disagreed with the statement that an efficient public transport system is required in the city. It was concluded that 42.8% of respondents agreed and 1% of respondents disagreed with the statement that there will be no congestion or traffic jam if better public transport is present in the city. An efficient public transport system was associated with traffic congestion relief (Noman et al., 2020). Remarkably, 82% of respondents agreed with the statement that proper handling of the existing transport system may decrease pollution and congestion. A good transport system might have decreased the number of private vehicles. Remarkably, 81.4% of respondents agreed with the statement that people were suffering from the poor public transport system in Faisalabad city. Notably, 61% of respondents agreed and 20.8% disagreed with the statement that quinqi rickshaws were the only mean of public transport in Faisalabad. Motorcycle rickshaws appeared to be the largest informal mode of public transport in Pakistan (Tahir, 2018). Significantly, 47% of respondents were with the view that a balanced fare system was not present in the city while 22.8% of respondents think that a balance fare system was present in the city.

Table 5: Perceptions toward Public Transport System Sustainability in Faisalabad City

Question	**Response**				
	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
	Frequency (%)	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**
An efficient public transport system is required in Faisalabad city	0	40 (8.0%)	42 (8.4%)	226 (45.2%)	105 (21.0%)

There will be no congestion or traffic jam if better public transport is present in the city	40 (8.0%)	1 0.2%	158 (31.6%)	141 (28.2%)	73 (14.6%)
Proper handling of the existing transport system may decrease the pollution and congestion	0	0	3 (0.6%)	233 (46.6%)	177 (35.4)
People are suffering from the poor public transport system in Faisalabad city	0	0	6 (1.2%)	289 (57.8%)	118 (23.6)
Qingqi rickshaws are the only mean of public transport in Faisalabad	41 (8.2%)	63 (12.6%)	4 (0.8%)	211 (42.2%)	94 (18.8%)
A balanced fare system is present in the city	41 (8.2%)	194 (38.8%)	64 (12.8%)	113 (22.6%)	1 (0.2%)

Table 6 shows that 59.6% of respondents agreed and 8% of respondents disagreed that the existing roads must be properly managed in Faisalabad city. Significantly, 69.2% of respondents agreed with the statement that there is a need for better management of traffic congestion in Faisalabad city. 73.8% of respondents agreed and 0.2% of respondents disagreed with the statement that faster assistance to the vehicles involved in road traffic accidents. Most of the respondents agreed that chain accidents can be avoided by securing the accident site (Hauer, 2020). Significantly, 59.4% of respondents disagreed and 2.4% of respondents agreed with the statement that there were parking spaces in Faisalabad city. Remarkably, 54.8% of respondents disagreed and 18% agreed with the statement that sufficient road marking is present on city roads. Road marking plays a critical role in guiding autonomous vehicle drivers and efficiently increasing road safety measures (Wen et al., 2019). Notably, 41.2% of respondents agreed and 10.2% disagreed with the statement that proper signboards were present on the city roads. Traffic signboards were considered the eyes of roads that enhance the intelligent transport system (Alam &

Jaffery, 2020). Respondents of 38.4% agreed and 35.4% disagreed with the statement that pedestrian bridges were sufficient in the city. The use of pedestrian bridges was found to be safe and efficient to reduce the risk of accidents on the main road of mega cities (Banerjee & Maurya, 2020). Strikingly, 51.6% of respondents agreed and 21.8% of respondents disagreed with the statement that good coordination exists between the departments like FDA, WASA, CTPF, Rescue 1122, etc. The dilemma of coordination between the allied departments was found destructive to the development of megacities (Javed & Riaz, 2020).

Table 6: Perceptions toward Roads and Traffic Management in Faisalabad City

Question	Response				
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
The existing roads must be properly managed	0	40 (8.0%)	75 (15.0%)	154 (30.8%)	144 (28.8%)
There is a need for better management of traffic congestion in the city	0	0	67 (13.4%)	226 (45.2%)	120 (24.0%)
Faster assistance to the vehicles involved in road traffic accidents	0	1 (0.2%)	43 (8.6%)	325 (65.0%)	44 (8.8%)
Electric signals are working properly	0	206 (41.2%)	82 (16.4%)	125 (25.0%)	0
There are parking spaces in the city	112 (22.4%)	185 (37.0%)	104 (208%)	11 (2.2%)	1 (0.2%)
Sufficient road marking is present on the city roads	2 (0.4%)	272 (54.4%)	49 (9.8%)	90 (18.0%)	0
Proper signboards are present on the city roads	42 (8.4%)	9 (1.8%)	156 (31.2%)	205 (41.0%)	1 (0.2%)
Pedestrian bridges are sufficient in the city	44 (8.8%)	133 (26.6%)	44 (8.8%)	192 (38.4%)	0
Good coordination exists between the departments like	97 (19.4%)	12 (2.4%)	46 (9.2%)	163 (32.6%)	95 (19.0%)

FDA, WASA, CTPF, 1122, etc.	

Encroachments and illegal or unnecessary U-Turns are also considered the as the root cause of traffic congestion and road traffic accidents. Encroachments block a portion of the carriageway restricts the smooth flow of traffic and cause pain. The general public damages the road according to their own need neglecting the collective benefits of the road users. The encroachments at Dhudiwala Jaranwala road cause immense pain for the road users and restrict traffic movement resulting in traffic congestion. Some U-Turns increase traffic congestion and are vulnerable to accidents. U-turns in front of NFC University, Jalvi market and u-turns in front of Faiz Petroleum are illegal u-turns on Jaranwala road. The wrong parking at the Kohinoor and Centre point causes pain for the road users. The encroachments at the motor market near Abdullahpur also restrict the carriageway. The fruit vendors near Novelty Bridge, D-type Bridge and Korianwala Bridge and shop keepers at service road restrict the traffic flow at Samundri road. Unnecessary and accidents vulnerable u-turns are near LCM High School and Total Petrol Pump. U-turn near Sannat Singh Railway crossing and u-turn near Mehndi mohalla increases traffic congestion. These are traffic congestion points at Jhumra road and are prone to road traffic accidents.

U-turn Nishatabad Bridge towards Gatwala, u-turn Sizing stop, u-turn near Shell pump, u-turn Bhatta stop are illegal u-turns of Sheikhupura road that cause traffic congestion and are accidents vulnerable points at Sheikhupura road. Wrong parking near Misak-ul-mall and encroachments restricts the carriageway and creates traffic congestion. The encroachment at millat road near Millat chowk, the illegal rickshaw stands at Noorpur stop and unnecessary u-turn at this point block the carriageway and restrict the traffic flow. The encroachments near Akbarabad and the illegal rickshaw stand in front of Allied Hospital and Passport office create traffic congestion at Jail road. U-turn near Fiaz Petrol pump, u-turn near old Haji camp, near Rescue 1122 office, u-turn PSO near Lasanipulli, u-turn 7 Chak stop near Bypass are illegal u-turns of Sargodha road that cause immense pain for the road users and are congestion and accident vulnerable points at Sargodha road. The Flea market at Rajbah road is a big encroachment that causes traffic congestion, especially in the winter season. The unavailability of a pedestrian bridge near the CBD is also a big cause of slow traffic flow. A small bridge near Khawaja Stand is a hurdle to the traffic flow. U-turn near Police Station Rail bazaar at Corporation road is a major cause of traffic congestion outside of the Rail bazaar. U-turn Total Petrol pump near Gulberg chowk, u-turn near PSO pump near Bohranwala

chowk and u-turn 79 mor are the illegal u-turns of the Narwala road. The encroachment near Kaleem Shaheed Park and Madanpura restricts the traffic flow and is the main traffic congestion and accident vulnerable point at Aminpur road.

Conclusively, it was evident from the above-mentioned facts and public perception about road network infrastructure, traffic congestion and road traffic accidents that several conditions determine traffic congestion and accidents. The number of vehicles and encroachment at some specific point and time determine the level of congestion. Especially, motorcycles and rickshaws were the major cause of traffic congestion. The capacity of the carriageway also plays a significant role in this regard. Instant u-turns and rutting increased the risk of congestion and accidents. In this regard carelessness of drivers was found a major cause of accidents. People were of the view that slow-moving vehicles, traffic congestion and encroachments increased the risk of accidents. Wrong parking and unseen damaged roads increased the risk of accidents. Most of the respondents were of the view that rickshaws were the main cause of the accidents. A better public transport system was found necessary for the city that will decrease the load of vehicles and traffic congestion. Many people think that rickshaws were the only public transport vehicles operating in the city. The public parking spaces were found deficient along with ill-maintained electric signals and road markings in the city. The coordination among the allied departments was found poor and a big hurdle in attaining sustainability.

Socioeconomic and environmental sustainability is linked with social homogeneity, economic burden, the prosperity of the people and adverse or pleasant environmental conditions of the city. The road network is the key element to the socio-economic prosperity and sustainable development of a city. Mobility means the city gives direction to development. The road network of Faisalabad is in a dynamic phase that is undergoing many changes according to the needs of society. Service roads and new underpasses have been added to the road network of the city. The public transport system plays a vital role in the mobility measures that cast a positive impact on the lives of the city people. The lower and middle class that may not afford their vehicle can enjoy the low-cost public transport vehicle. Table 7 shows that 34.8% of respondents agreed and 29.2% disagreed with the statement that bad roads damage people's life and property. Significantly, 68.6% of respondents agreed with the statement that pollution caused by traffic suffers people's socio-economic life in Faisalabad city. Notably, 76% of respondents agreed and only 0.4% of respondents disagreed with the statement that the socio-economic life of people suffers from traffic congestion and blockage. Particularly only

17.4% of respondents reached their destiny in time while 47.8% of respondents could not reach their destiny in time.

Unfortunately, the public transport system of Faisalabad city is not considered a developed system. Instead, currently, there is no single route of urban transport is working properly in the city. The road network of Faisalabad city has no bus bays and there is no use of bus bays by the public transport vehicle but for parking and encroachment purposes. The bus bays at Samundri road, Satiana road, and Narwala road are used for either parking places or encroachment purposes. The service road of the city is also used for the same purposes. The public transport system is the backbone of socio-economic development. The Faisalabad Urban Transport System (FUTS) is the main public transport operator in the city. This system was launched in 1994 and operates a large number of buses and Toyota Hiace vans in the city.

Table 7: Perceptions towards Socioeconomic Problems of Road Network and Sustainability

Question	Response				
	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
	Frequency (%)	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**	**Frequency (%)**
Bad Roads damage people's life and property	83 (16.6%)	63 (12.6%)	93 (18.6%)	137 (27.4%)	37 (7.4%)
Pollution caused by traffic suffer people's socio-economic life in Faisalabad city	0	0	70 (14.0%)	262 (52.4%)	81 (16.2%)
Socio-economic life of people suffers from Traffic congestion and blockage	0	2 (0.4%)	31 (6.2%)	338 (67.6%)	42 (8.4%)
People can reach their destiny in time	34 (6.8%)	205 (41.0%)	87 (17.4%)	87 (17.4%)	0

A public-private bus operator, Brothers Metro's air-conditioned CNG buses are still working in the city. These buses are operating on a single route that cannot meet the needs of the city. There are many other routes are working in the city with limited vehicles and potential. Route number 1 is

on the Jaranwala road, route number 2 from aminpur road to Narwala to Dijkot road to Samanbad to D-type to Warispura gole to D-ground but now potentially is not working. Route number 3 is from Narwala to Manawala but currently not working. Route number 5 was from Narwala to Akbar abad, route number 7A and 7B from Sadhar to Narwala and from Narwala to Sargodha road. Route number 6 was towards Chak no. 204, route number 11 from Khurrianwala to Nawabanwala. But unfortunately, all these routes are not working properly and efficiently.

From January 2016 to July 2020 total of 113874 accidents happened in which 131457 people including men, women and children were recorded as victims out of which 1070 people died on the spot or later. In this regards people of the city are paying a heavy price by losing their lives and vehicles/property in these accidents. Atubi and Gbadamosi (2015) found that road traffic accidents were impacting the socio-economic life of people. In most accident cases there is no compensation provided from the insurance companies as the insurance policies are not well developed and well-reputed in Pakistan. Many traffic police officials were interviewed on main roads and squares of the city and asked questions about the accidents and what kind of compensation they managed at the spot of the accident. All officials agreed with the view that compensation during the settlement of the accident to the aggrieved party is very low. And this compensation is not from the side of insurance companies but the other party of the accident. There is no proper vehicle damage repair from the insurance companies the loss of the public is purely the loss of the public. Poor road infrastructure also causes vehicle damage which also increases the economic burden on the people. On the other hand, the rutting on the road along with other damages and congestion increases travel time and the use of fuel. Increased travel time and use of fuel not only increase the economic burden and also damage the environment of the city. Lead contamination along with carbon monoxide causes many direct and indirect diseases which are a grave concern in people's social and economic life.

4. CONCLUSION

This research was conducted by keeping in mind the 11th goal of sustainable development "sustainable cities and communities". The present research investigated whether Faisalabad city is moving towards or away from sustainability in respect of road infrastructure, local traffic load conditions, and prevailing accidents, socio-economic conditions of people and public perceptions of environmental health. Road network performance in high peak and low peak hours is different. The capacity and load-bearing space play a pivotal role in addressing the problems of

congestion. The areas with service roads balance the traffic load and provide the space for delayed and congested traffic. Rutting and other road infrastructural damages increase the burden on the people in terms of travel time, vehicle damages, accidents, extra consumption of fuel and more environmental pollution which increases the risks. Majority of the respondents did not attend any kind of seminar/walk/first aid course.A small proporion of respondents agreed that the condition of roads is satisfactory in Faisalabad city. Poor maintenance of roads is another problem that suffers the general public. Traffic congestion and blockage suffered general public life in the city. Encroachment along with wrong parking, poor road management and Donkey carts were found the main cause of congestion in Faisalabad city. City traffic police manage traffic issues by imposing traffic violation fines to eradicate and minimize road traffic accidents and congestion. Socioeconomic and environmental sustainability is linked with social homogeneity, economic burden, the prosperity of the people and adverse or pleasant environmental conditions of the city. The road network is the key element to the socio-economic prosperity and sustainable development of a city.

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