

# **How does car-centered infrastructure affect the layout of Aqtöbe and methods of transportation of its people?**

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## Abstract

This research aims to analyse the infrastructure of and the usage of transportation in Aqtöbe city and, by doing so, search for indications and consequences of car-centrism. By examining qualitative data collected with a survey, certain patterns were found related to transportation used by and the district in which the respondents lived. Additionally, the research attempts to provide possible solutions and improvements, which might be useful for further urban design and city restructuring by local authorities.

Keywords: *Aqtöbe, car-centrism, infrastructure, liveability, transport, walkability.*

Бұл зерттеудің басты мақсаты — Ақтөбе қаласының инфрақұрылымы мен қолданылатын көлік түрлерін талдап, мәшине тәуелділігінің (атап айтқанда кар-центризмнің) белгілері мен салдарларын табу. Сауалнама арқылы жиналған сандық ақпаратты тексеріп, жауап берушілер арасында қолданылған көлік түріне және тұрған шағынауданына сәйкесті байланыстар табылған. Сонымен қатар, зерттеу барысында табылған әлеуетті шешімдер жергілікті өкіметке болашақтағы қалалық құрылысында пайдалы болуы мүмкін.

Кілт сөздер: *Ақтөбе, кар-центризм, инфрақұрылым, ішкі өмір сүру қабілеті, көлік, ішкі жүру қабілеті.*

Главная задача данного исследования — анализировать инфраструктуру и используемый транспорт в городе Ақтөбе и найти знаки и последствия машинозависимости (точнее кар-центризма). С помощью количественных данных, полученных из опроса, были найдены закономерности среди отвечающих в зависимости от используемого транспорта и микрорайона в котором они живут. Вместе с тем, потенциальные решения, найденные в процессе исследования, могут быть применены местной властью в целях городской перестройки.

Ключевые слова: *Ақтөбе, кар-центризм, инфраструктура, внутренняя жизнеспособность, транспорт, внутренняя возможность хождения.*

## Introduction

The car is one of the most popular modes of transportation in the world. Millions of people travel and commute by car. The usage of cars has become a norm in numerous societies and communities. This, however, had its own (negative) consequences on the way

infrastructure was shaped, methods of transportation, public health, the safety of residents, as well as the environment.

In the 20th century, cities experienced a rapid growth in usage of private vehicles around the world. The cities and urban areas that were primarily built for pedestrians had to be reconstructed and redesigned to fit the automobiles. This has permanently reformed the cities and their interiors. Parking lots, wider roads, traffic lights, gas stations, etc., are some examples of facilities and parts of the infrastructure that were affected in every settlement across the world by automobiles. Additionally, the car-centric infrastructure tends to create low-density, spread-out communities (Schuetz et al., 2018) that potentially may lead to social isolation. The main reason why car-centrism was ignored and hence was let to take over an abundant amount of cities is the fact that there was no interest in exploring the user experience of residents (Bozovic, 1970).

As was noted before, car-centric infrastructure leads to a city layout that mainly benefits the users of automobiles with little focus on pedestrians and thus creates low-density, spread-out settlements (Schuetz et al., 2018). However, this is not the only outcome of such an infrastructural approach, as it leads to environmental damage and numerous preventable (premature, but not exclusively) deaths (Mueller et al., 2020).

The focus of this research will be the city of Aqtöbe, within which the car-centric infrastructure, while not as evident as in some other urban areas, is present. For instance, many pedestrian roads in the city are usually pavements (or sidewalks); in other words, they are mostly placed next to roads that are not only unsafe to walk nearby but also demonstrate that city designers mainly focus on the movement of automobiles rather than pedestrians/public transit.

Green and sustainable infrastructure that favours people and accessible means of transportation has been my interest and I have always wanted to live in a lively and liveable city. Living in a family with no car for most of my life, I had to travel by bus or bike. As a result, I saw the poor state of public transit and infrastructure for other means of transportation.

## **Aims**

The research aims to find evidence of this issue in Aqtöbe and recommend measures to improve the current state.

The objective of the research may be broken down into three questions.

*What is the city layout of Aqtöbe like?* It is essential to understand the city's infrastructure before defining its flaws and inconveniences.

*What are the modes of transportation commonly used in Aqtöbe, and how satisfied are people with them?* By analysing the ways people travel, the conclusion on accessibility of certain transit means can be made, and the relevance of the issue can be defined.

*What recommendation can this research provide for the Aqtöbe officials by exploring the strategies implemented in other cities/countries?* After the research is complete, its primary purpose will be to help reshape the city in a way that will benefit the locals. It can be

achieved by investigating and borrowing the experiences of others.

## **Literature Review**

Liveability [of a community] is a broad term, usually referring to the environment from the residents' perspective and subjective measurements of the location's quality (Heylen, 2006, as cited in Shamsuddin et al., 2012). Liveability is considered one of the factors that influences the quality of life by affecting citizen's lifestyle and health (EIU, 2011, as cited in Shamsuddin et al., 2012). Lennard (2008, as cited in Shamsuddin et al., 2008) states that a liveable city focuses on the sustainability of transportation in order to decrease noise and air pollution, and additionally, it encourages its residents to walk.

Another term often used interchangeably with the word 'liveability' is 'walkability' and 'walkable'. Shamsuddin and others (2012) give no clear definition to the word, instead they explain the term as a measurement of a thing that is 'walking-friendly'. On the other hand, Talen and others (2013) define a walkable neighbourhood as a "safe, well-serviced neighbourhood, imbued with qualities that make walking a positive experience." Both terms are similar in specific ways since they both value the user experience of the citizens, with 'walkability' putting more emphasis on pedestrians.

The last important term is transit-oriented development (TOD), an infrastructural planning that focuses on sustainable transportation means that are convenient and desirable. The process of TOD often merges urban planning, transport engineering, land use planning, and urban design (Ibraeva et al., 2019).

In the 20th century, there has been a rapid increase in car usage throughout the world. Priorly pedestrian-oriented cities were flooded with automobiles, permanently influencing the infrastructure and layouts of communities. It can be seen in any settlement; the newly-built blocks have more specialised areas for large vehicles (i.e. parking lots, wider roads, etc.), unlike the old parts of cities/towns. One example of this is Los Angeles, which started its growth at the beginning of the automobile era, and it has made it a low-density, scattered metropolis built around the major highway system (Schuetz et al., 2018). The reason why city administrations let the city infrastructure be shaped that way is partly due to the historical lack of interest in and data about the user experience of residents living in their respective urban areas (Bozovic, 1970).

There are numerous reasons why liveable/walkable cities should be implemented, partly due to aligning with movements to fight climate change, enhance public health conditions and, or increase equity of participation among the residents of a community (Bozovic, 1970). A study has been conducted in Los Angeles, the United States. As was said, Los Angeles was an example of a car-centric, low-density city. Since the 90s however, local authorities have attempted restructuring Los Angeles to increase the density in the areas and encourage mixed-use transportation that does not necessarily rely on cars. Transit-oriented development in the said metropolis is also present, as there were investments in railway transit. The results of the examinations demonstrate that the areas around the railway stations have experienced a rise in employment rates (Schuetz et al., 2018).

15-minute cities are communities that put emphasis on walking and places of basic needs and essential services (i.e. shops, clinics, pharmacies, cafés, gyms, etc.) being within

reach. Such neighbourhoods had daily outdoor activities even during the COVID-19 pandemic lockdowns (Abdelfattah, 2022). The said infrastructural approach manages to create sustainable and carbon-free urban districts that are centred around pedestrians rather than cars. Similar to 15-minute cities are the superblocks (from Spanish ‘Superilla’), 400×400m neighbourhoods with interior roads that are mainly oriented towards active transportation means (i.e. walking and cycling) (Mueller et al., 2020). The research estimates that the further implementation of superblocks can prevent a large number of premature deaths annually, as well as reduction of air and noise pollution, and street temperature in Barcelona, in which such an infrastructural approach has been taken.

Previously mentioned superblocks provide an internal road network primarily designed for pedestrians and cyclists, with cars being less prioritised on the roads. The maximum automobile speed is set at 20km/h, ensuring pedestrian safety. Moreover, the bus stops in this layout approach will be placed every 400m, in other words, every superblock (Mueller et al., 2020).

Wheeler (2004, as cited in Shamsuddin et al., 2012) stated that the physical layout of a city must correlate to human size, with correspondence to transit systems, climate change, natural change, communications, parks, etc., with no manipulation of the natural resources. Simply put, cities should emphasise the human scale (and not cars); thus, the distance between the buildings, the facilities, and the sizes of the said two must not be overly sizeable compared to a human.

Transitions towards less car-dependent communities are common and take place around the world. Research conducted to analyse implementations of transit-oriented development has shown that radical or fast executions are usually met with resistance from the public. To be able to convert to a community with a focus on public transit, it is recommended to create institutions that gradually shift the social norms and routines of residents, which in turn will reduce the necessity for automobiles, creating an environment ready to transform (Hrelja & Rye, 2022). Another paper reveals that outcomes of TOD across the world are various, which indicates that changes were not always positive (Ibraeva et al., 2019).

## **Methods**

Data collection is a prerequisite in any research process. Information on the topic was collected from other countries by writing a literature review. Additionally, I decided to collect quantitative data myself from the city residents.

There are two main styles of data collection: Quantitative and Qualitative. Quantitative researches mainly focus on numerical information and tend to make generalising conclusions based on the figures. On the other hand, qualitative researchers are more concerned with comprehending each perception, often ignoring the social aspects, by focusing more on the scientific approaches (Bell & Waters, 2014, p. 9).

The selected data collection tool was a survey. Scheuren (2004) stated that “The word ‘survey’ is used most often to describe a method of gathering information from a sample of individuals”. A sample, as he described, is a section of the population that is being researched. Ideally, sample sizes ought to be 100 per cent of the population. Realistically, the

researchers aim to collect data from a representative portion of it (Bell & Waters, 2014, pp. 14–15). Sample sizes might vary affecting and depending on the reliability of the collected information.

The survey was a preferable data collection method for various reasons. The goal of the data collection was to better understand the experience of residents. Qualitative research design is not an advantageous option due to the large size of the population. Surveys allow asking people identical questions (Bell & Waters, 2014, pp. 14–15), thus collecting more reliable information.

The survey consisted of 4 sections and had 14 questions in total. The sections were as follows:

1. Demographic information about the respondent (4 questions, for how long they lived and which micro-district they live in)
2. The satisfaction with the city (3 questions, particularly the satisfaction with city layout, walkability, and infrastructure for alternative transport)
3. Transportation methods, satisfaction with them, and reasoning (3 questions)
4. The possibilities of local authorities to improve the situation (4 questions, of city layout, of infrastructure for transport and transport itself)

The satisfaction levels and respondents' ratings were measured using the Likert scale, and the demographic information and opinions of respondents in the fourth section were requested with multiple-choice questions (only one answer can be chosen). There was a single multiple-answer question (multiple answers can be chosen) asking for transportation means of the respondents and two open-ended questions.

The studied population were the residents of Aqtöbe city. As noted earlier, the sample should be able to represent the whole population (Bell & Waters, 2014, pp. 14–15). The population of Aqtöbe in 2021 (about 2–3 years before the research) was 512,452 (*Aqtöbe*, n.d.). Based on the calculations performed on the sample size calculator on SurveyMonkey's website, the sample size with a 90% confidence level and a 5% margin of error should be greater or equal to 273 persons. However, since I am a high-school student and do not have access to tools to conduct the survey more efficiently, collecting such a number of responses was unrealistic. The set goal was 100 responses.

I have sent the link to the survey to classmates and school personnel. In addition, I have manually filled out some of the responses of people whom I had taken the survey in-person from. The verbal surveys consisted of the same questions as in the survey and the people who were asked were residents recreating in the city centre.

Out of all the research stages, the data collection presented the most significant challenges. It was previously mentioned that due to the lack of appropriate instruments, the survey was quite challenging to conduct, and the number of participants was relatively low. Furthermore, since some of the responses were inserted manually by filling out the responses verbally, the questions were not verbatim, which marginally undermined the reliability and consistency of the survey.



## Results

As of April 28, 2024, the number of responses to the survey was 73, which is not sufficient. Therefore, the results of the survey might be considered unreliable. Nevertheless, with the little information gathered, certain correlations were evident.

Unanalysed data outlined the general statistics related to the topic. The sample consisted of residents of Aqtöbe city of various ages. The great majority of the respondents have lived in the city for more than ten years. About a third of respondents live in Altn Orda (formerly Batys-2) district, and another third live in the city centre (Figures 1–4).

The general public is mostly satisfied with or tolerant of city layout and walkability (average scores are 3.56 and 3.25 out of 5, respectively). However, most people tend to be more dissatisfied with the infrastructure for alternative transportation means (average score 2.56 out of 5; Figures 5–7).

More than half (42 persons) of respondents use buses, and nearly half (33) of respondents walk on foot. About two-fifths (31) of the sample regularly use cars for transportation, and approximately a third (22) of people move around the city in taxis. Respondents who travel by bike and, or scooter were a minority (8 and 1, respectively). People tend to be mildly satisfied with their chosen method of transportation, with an average score of 3.44 out of 5 (Figures 8, 9).

The vast majority of respondents believe that the authorities can change the situation in the city (87.6%, 93.1%, and 90.5% of respondents answered “Yes” or “Possible” for three questions, respectively; Figure 10).

Further analysis of the data was conducted, revealing more thorough results. The information was analysed twice, searching for patterns based on the chosen transportation means and the district respondents lived in.

Respondents were able to choose more than one method of transportation. Residents were grouped into multiple categories based on their modes of transport. The main three of them were pedestrians (those who travel on foot), bus travellers, and car travellers. Afterwards, the categories were divided into sub-categories based on their other transportation means.

With that said, certain patterns were observed. Pedestrians are, on average, the most dissatisfied group: people who travel solely on foot tend to be discontent with the walkability in their districts and pedestrians who do not travel by car are least satisfied with their modes of transportation (3.39 and 3.13 out of 5, respectively). Car travellers, particularly those who do not travel on other modes of transport, on the other hand, are usually the most satisfied group. They are the most tolerant of the city’s layout and the mode of transportation (4.17 and 3.67 out of 5, respectively). Surprisingly, non-car-only travellers are significantly more pessimistic about the walkability levels and the city layout. Respondents travelling by bus who do not use cars are most content with the walkability in their area of residence, and those using the bus as the only method of transportation find infrastructure for alternative transport convenient the most (figure 11).



Subsequently, the data was analysed based on the districts the residents lived in. Respondents were divided into six groups: residents of Altın Orda, city centre, suburbs (Aqjar, Jilyanka, Zarechnyy, Kirpichnyy), old city, Residential Area (from Kazakh “тұрғынқалашылық”; also includes the Military Area—from Russian “Военный городок”—for the sake of brevity), and other areas.

Respondents living in sub-urbs tend to be generally less satisfied with the city infrastructure; moreover, they are largely reliant on buses and automobiles. The most dependent on the mentioned two modes of transport are residents of the Residential Area; they are also the second most dissatisfied with the transportation used, following the residents of suburban areas; nevertheless, respondents living in the Residential Area stated their high satisfaction with the city layout. As the survey depicted, people living in the city centre are significantly less dependent on private vehicles and least reliant on automobiles (owned cars and taxis) in general. Additionally, they, together with citizens residing in Altın Orda, are more likely to travel by bicycle and, or scooter (during summer), and are generally more satisfied with the transportation methods used (Figure 12).

The results of the second analysis provided detailed information about the areas within the city. They depict that the residents living in areas further from the city centre usually travel in private vehicles (cars). Only a meagre number of people move around the city on foot, on bicycles, or scooters. Even so, a major section of those travelling on the former two modes of transport resides in Altın Orda and the city centre, which may be due to the presence of bike lanes and wide, paved sidewalks. The quality of infrastructure in more remote areas is highly undeveloped, but it is the contrary in the city centre and currently sprawling Altın Orda district. Respondents living in the Residential Area are more pleased with the city layout since the infrastructure is much denser in the district. This follows Wheeler’s (2004, as cited in Shamsuddin, 2012) idea of physical layout—the infrastructure ought to correlate to human size.

The survey had two open-ended questions, one asking for the reasoning of their satisfaction with their chosen transportation method and another requesting recommendations related to the issue.

It is evident that many people travelling by bus mainly complain about buses, mainly that they are old, dirty, often packed, and the waiting time for buses is long (or in other words, they come very rarely). The most common complaint by those travelling by cars. Other complaints consisted of:

- Lack of crosswalks
- Lack of sidewalks
- Excessive number of cars and traffic jams
- Buses being cold
- Mud (while walking)

Proposed solutions included:

- Put more buses and bus routes into service
- Fixing roads
- Increasing the number of buses and renewing the old buses

- Constructing bike lanes
- Dealing with corruption or with problems related to the government
- Improving infrastructure
- Improving the quality of bus service
- Providing more modes of public transportation

## **Conclusion**

Aqtöbe city is a constantly growing city, whose rising population leads to the sprawling of the city itself. The research explored Aqtöbe's layout, means of transportation of the residents, and solutions to the issue of car-centrism and deriving car-centric infrastructure.

The physical layout of the city was found to be rather faulty in certain areas. Due to the lack of reliable public transportation and poor connection between the districts, many residents are forced to travel across the city by car. Additionally, many areas in Aqtöbe city were not designed for a human scale, evident from the large distances between the buildings and the lack of sidewalks.

Upon collecting residents' opinions on the city, it has been demonstrated that the residents are aware of the problem or other problems relating to the studied one. It has been revealed that residents are largely dissatisfied with the city's infrastructure for alternative transport; a large portion of the population travels on buses and foot, with a minority using cars or other transportation methods. Based on the satisfaction levels with used modes of transport, it is safe to assume that Aqtöbe is far more convenient for those travelling by car.

Throughout the research process, many recommendations and possible solutions were collected from both city residents and other research papers, exploring similar issues in different countries and cities. In terms of infrastructure, implementing 15-minute cities and, or superblocks that primarily focus on active transport might improve safety, cool down the streets and positively impact the environment (Abdelfattah, 2022; Mueller et al., 2020). Citizens of Aqtöbe also listed certain, more straightforward recommendations mainly concerning the state of transport in the city: expanding and updating the bus network, fixing roads, building bike lanes, and improving general infrastructure.

Nonetheless, some limitations and problems that were met during the research. The main one is the sample size, which was not only smaller than the recommended and reliable size, but also smaller than the set goal of 100 responses. Clearly, the survey also had a problem with the reliability of data due to improper and lacking data collection.

To conclude, car-centrism and car-centric infrastructure lead to numerous problems with the overall infrastructure and affect daily life negatively. Aqtöbe's infrastructure is unequivocally primarily oriented toward cars. As a result, the city layout is not planned out for public transportation and pedestrians, causing urban sprawl. The restrictive nature of Aqtöbe's transportation and the poor quality of public transport eventually led to a high reliance on cars, which in itself is car-centrism.

## **Evaluation and Further Research**

The research was relatively successful as it achieved its primary goal and answered the research question. Nevertheless, the research is still very lacking and needs further study. The data collection process was mainly focused on transportation; thus, the research revision is required, addressing the city layout of Aqtöbe. Additionally, properly conducting a survey would also be a prerequisite for the sake of reliability.

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## Appendix

Which age category are you a member of?

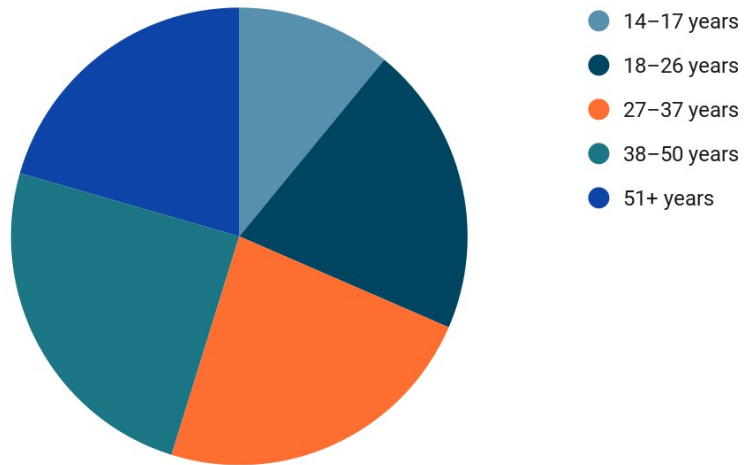


Figure 1.

How many years have you lived in Aqtöbe [city]?

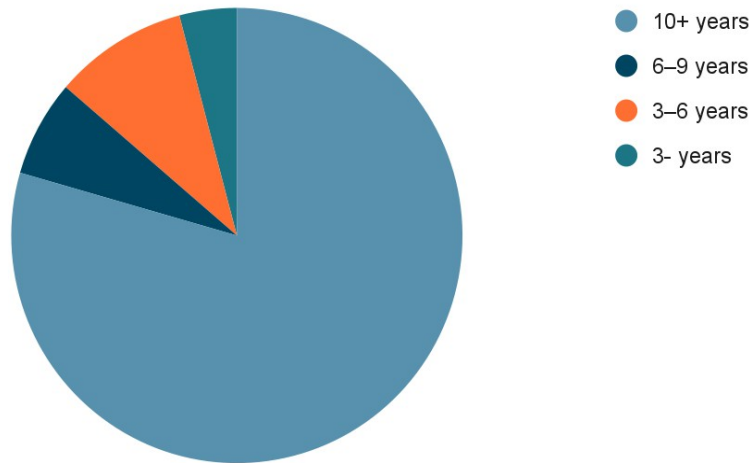


Figure 2.

Choose district that you live in

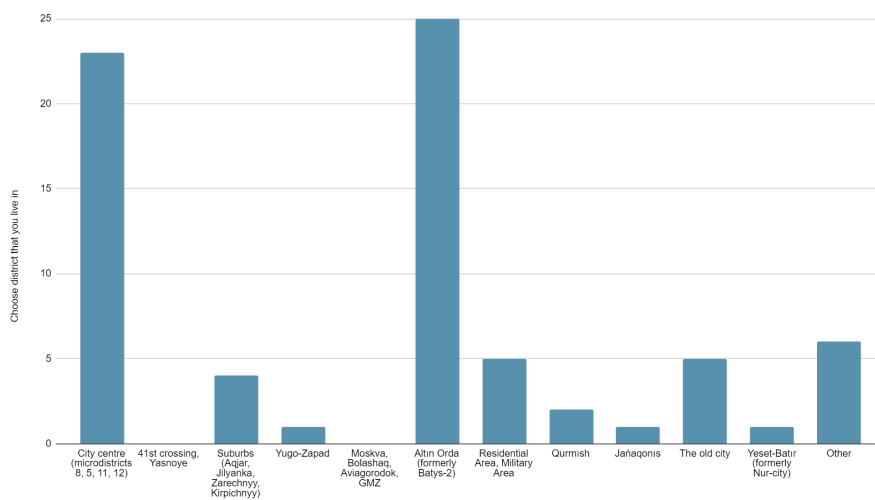


Figure 3.

How long have you lived in your district?

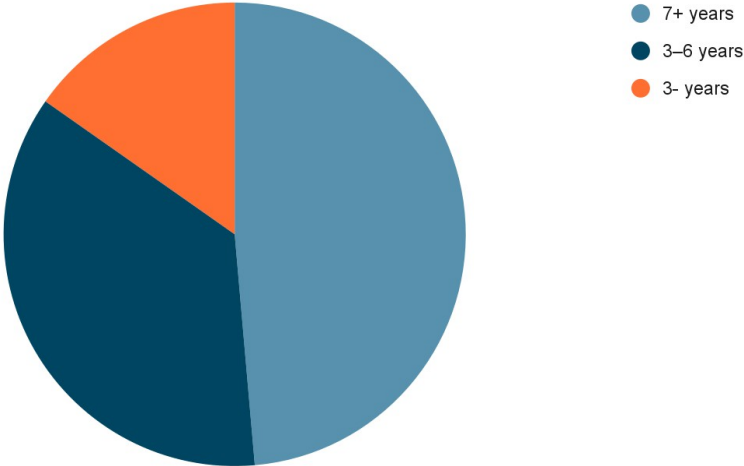


Figure 4.

How satisfied are you with the city layout?

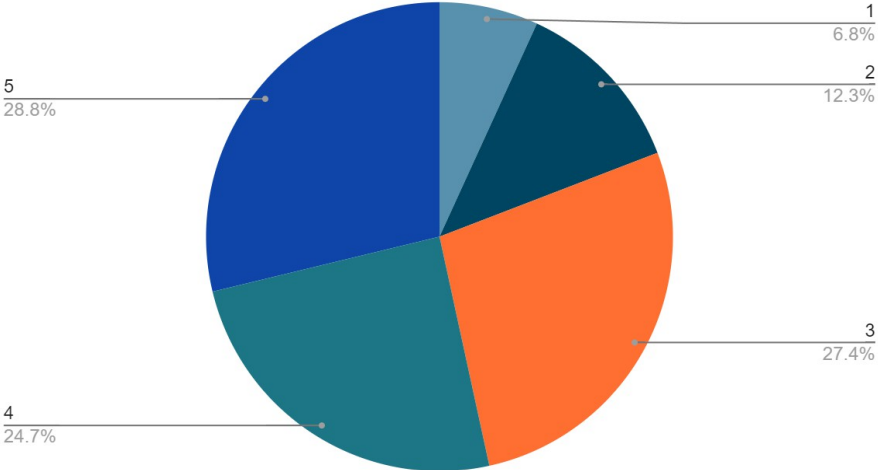


Figure 5.

How satisfied are you with the possibility of walking on foot

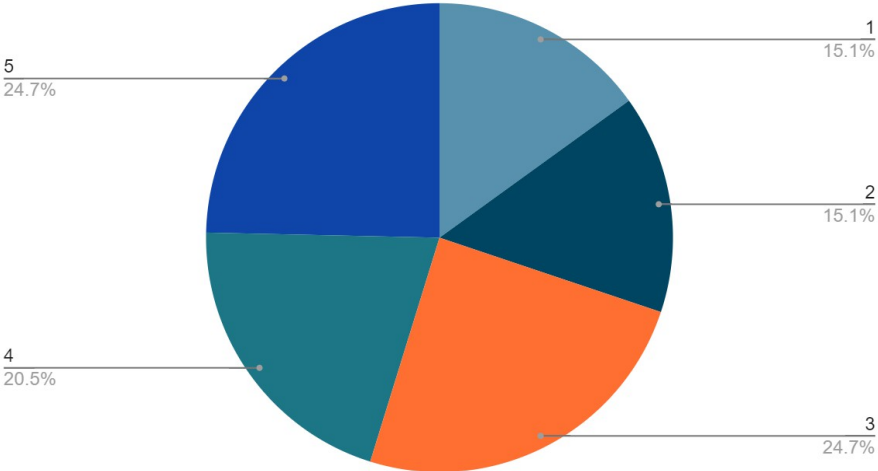


Figure 6.

### Rate the infrastructure for the alternative transport

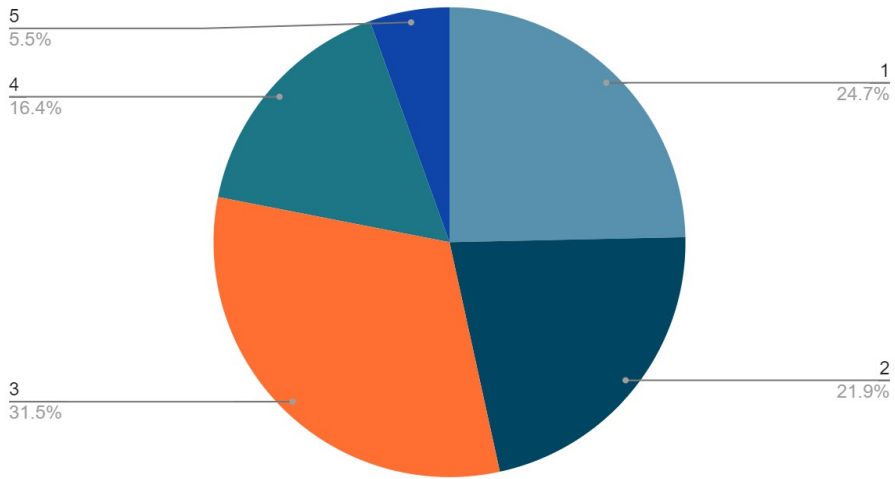


Figure 7.

### What transport modes do you use?

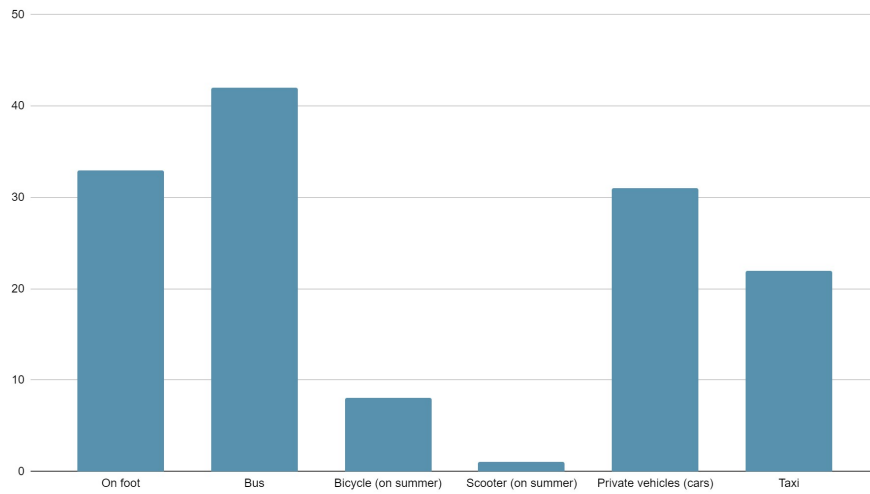


Figure 8.

### How satisfied are you with the chosen mode of transportation?

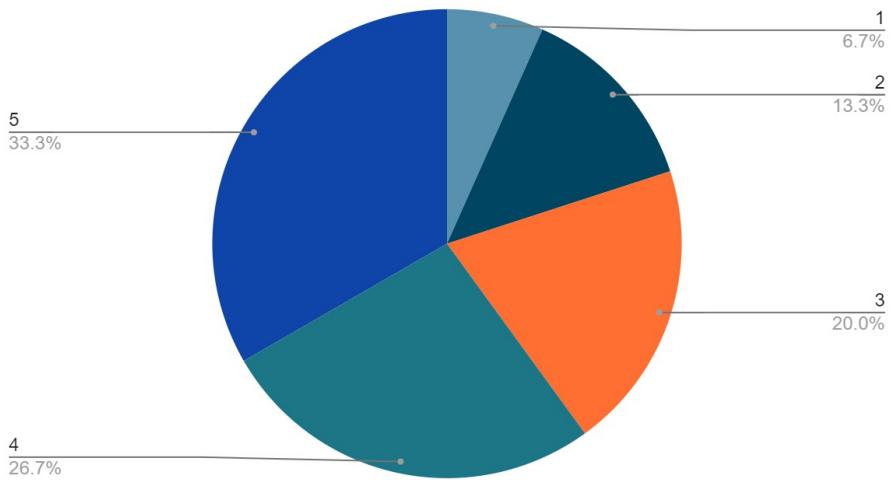


Figure 9.



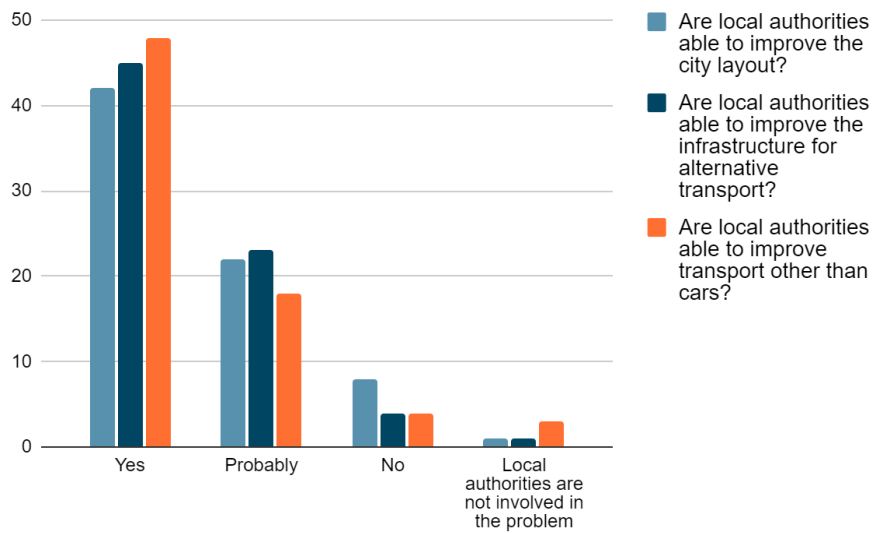


Figure 10.

	AVG: Satisfaction with city infrastructure	AVG: Satisfaction with walkability	AVG: Satisfaction with intr. for all t-port	AVG: Satisfaction with chosen transport	AVG: Overall satisfaction
Bus commuters	3.547619048	3.357142857	2.69047619	3.30952381	3.226190476
Bus commuters (Car excluding, Pedestrian including)	3.517241379	3.413793103	2.965517241	3.206896552	3.275862069
Bus-only commuters	3.538461538	3.384615385	3.153844615	3.153846154	3.307691923
Pedestrians	3.3939	3.1212	2.3939	3.1515	3.015125
Pedestrians (Car excluding, Bus including)	3.5652	3.3043	2.5217	3.1304	3.1304
Pedestrians-only	3.857142857	2.857142857	2.428571429	3.142857143	3.071428572
Car commuters	3.6452	3.0968	2.2258	3.6129	3.145175
Car-only commuters	4.1667	3.4167	2.6667	3.6667	3.4792
Non-pedestrian commuters	3.7	3.35	2.7	3.675	3.35625
Non-pedestrian-only commuters	3.5303	3.2879	2.5758	3.4697	3.215925

Figure 11.

Microdistrict	#	Age	Years lived in the microdistrict (7   3-5   <3)	Average satisfaction with...			Transportation (%)										Average satisfaction with chosen transport
				city infrastructure	walkability	IAT	Pedestrians	Bus	Car	Car or taxi	Pedestrian-only	Non-pedestrian	Bike/Scooter				
Altin Orda	25	Mainly early adults and partly elderly	Predominantly >10	5   12   8	3.32	3.04	2.76	10.48.00%	14.56.00%	12.48.00%	16.64.00%	1.4.00%	15.60.00%	4.16.00%	3.6		
City centre	23	Mostly early adults (18-37)	Predominantly >10	11   9   2*	3.8696	4.0435	3.1739	11.47.83%	12.52.17%	6.26.09%	12.52.17%	3.13.04%	12.52.17%	2.8.70%	3.6522		
Aqtöbe sub-urbs	4	early adults (18-37)	Only >10	3   1   0	2.25	1.75	1.25	2.50.00%	1.25.00%	2.50.00%	3.75.00%	1.25.00%	2.50.00%	0.0.00%	3		
Old Aqtöbe	5	Predominantly midlife adults (38-50)	Mostly >10	2   2   1	3	3	2	2.40.00%	3.60.00%	3.60.00%	3.60.00%	0.0.00%	3.60.00%	1.20.00%	3.2		
Residential Area (TQ)	5	Various	Predominantly >10	4   0   1	4.6	3	1.8	2.40.00%	4.80.00%	2.40.00%	4.80.00%	0.0.00%	3.60.00%	0.0.00%	2.8		
Other	11	5/11 are teens, the rest are 27+	Predominantly >10	7   2   2	3.8182	3.5	2.5682	6.54.55%	8.72.73%	6.54.55%	7.63.64%	2.18.18%	5.45.45%	2.18.18%	3.3864		
Total	73				3.4763	3.055683333	2.256683333	33.45.40%	42.97.65%	31.86.44%	45.65.88%	7.10.84%	40.84.60%	9.18.48%	3.2731		

Figure 12.