

Sustainability in Transportation through the Eyes of Czech Consumers

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Abstract: Sustainable transport is a highly debated topic in the context of reducing the carbon footprint. Among other things, this article provides an overview of different perspectives on sustainable transport behavior. The researchers focused on the Czech consumer and some aspects of their sustainable transport behavior. The aim of this paper is to present the results of a questionnaire survey on a representative sample of Czech consumers. The investigation focused mainly on the frequency of car use for transport, popularity and options for carsharing or public transport. Among others, factors hindering the use of public transport were identified. Furthermore, the researchers' attention was focused on the perceived environmental friendliness of different modes of transport. The results show that the Czech consumer perceives eco-friendly modes of transport positively, but he himself does not behave very sustainably in personal transport for various reasons, which will be presented in this article.

Keywords: carsharing; consumer behavior; sustainability; sustainable transport

JEL Classification: L62; M11; M31

1. Introduction

The chapter is focused on defining the concept of sustainability, specifically examining how sustainability is understood in the context of transportation. Various forms of sustainable transportation are described. Subsequently, current trends in the Czech Republic's automotive market are introduced in the context of the shift towards sustainable behavior in transportation. This chapter enlightens aspects of sustainable transportation examined in a research study, the results of which are later discussed in Chapter 2.

In this context, sustainability is conceptualized as a form of development that satisfies current needs without compromising the ability of future generations to meet their own needs. Emphasis is placed on consideration for future generations and a review of the impacts of consumer behavior. An alternative interpretation underscores the elemental idea that a sustainable system is one that survives and persists (Costanza & Pattern, 1995). This concept is further developed through the pillars of the Triple Bottom Line.

Sustainability is fulfilled on multiple levels, as outlined in the Triple Bottom Line, defined by John Elkington in the 1990s (Elkington, 2018). The Triple Bottom Line defines the main three pillars of sustainability – people, planet, profit. These represent the economic, environmental, and social pillars, which should be fulfilled synergistically. When addressing environmental protection in the context of transportation, it is necessary to also consider the

economic and social aspects of decision-making. Moreover, not all measures leading to sustainable transportation may be embraced by consumers and may not align with their needs and capacities (both social and economic pillars).

In the context of transportation, the phenomenon of sustainable development is closely associated with environmental impact, primarily addressing the reduction of CO2 emissions. Transportation, especially personal road transportation, significantly contributes to environmental pollution through CO2 emissions. Specifically, it is responsible for 60% of all emissions from transportation. Additionally, within the European Union, transportation accounts for almost 24% of all total emissions produced. Therefore, sustainability in transportation is primarily discussed in the context of reduction of CO2 emissions (faktaoklimatu.cz).

Within the context of sustainable transportation, reducing CO2 emissions is a fundamental aspect of achieving a less pollution produced in transportation. Sustainable transportation is based on operating and managing transportation with minimal negative impacts. It is, therefore, crucial to be aware of the impacts of one's behavior. Unfortunately, CO2 emissions in transportation are continually increasing. From 1990 to 2015, they nearly doubled (Zatloukal, 2015). However, in recent years, 2016, 2017, and 2018, the upward trend stopped due to the use of better fuels with different compositions and more efficient utilization of combustion engines, along with the gradual introduction of electric vehicles (ČHMÚ, 2020). The pandemic crisis halved emissions in land transportation compared to 2019; nevertheless, a return to higher numbers is expected. Restricting transportation could be one solution to the climate crisis, however this does not align with consumer needs.

Personal road transport significantly contributes to the deterioration of the situation carbon neutrality situation; therefore, attention is primarily focused on eliminating its impacts. On the other hand, statistics from the Association of Automobile Importers indicate an increase in registrations of new cars in the Czech Republic. Registrations peaked in 2017, followed by a decline. However, compared to 2004, when 125,768 new cars were registered, the 192,087 new cars registered in 2022 are still more than half higher.

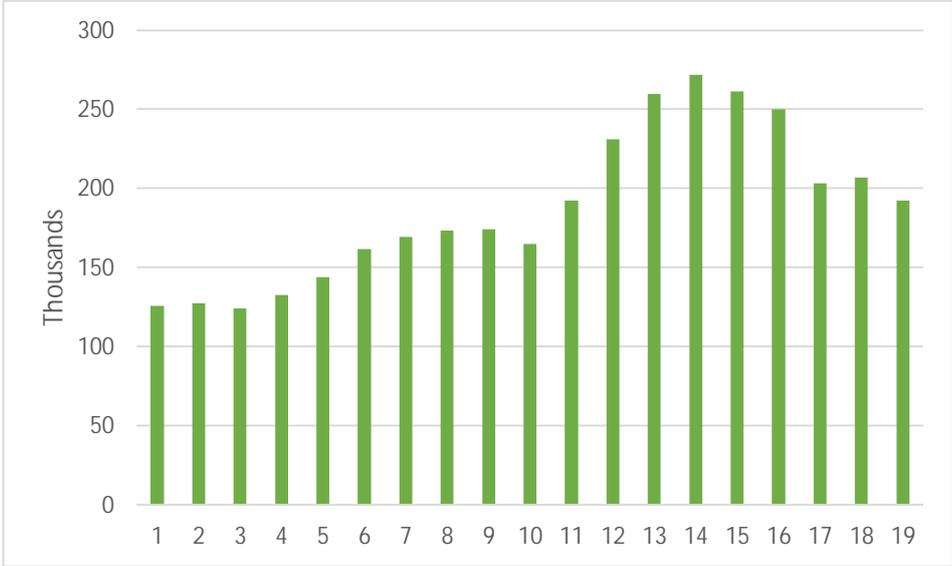


Figure 1. New car registration in the Czech Republic (based on the data according to the Association of automobile importers (2022a))

The decline of total number of newly registered cars in the last five years cannot be labelled as a shifting towards sustainable transportation in the Czech Republic. The COVID crisis followed by decreasing demand played a significant role in lower number of registrations. Thanks to the COVID crisis we are facing an increasing age of the vehicles used in a personal transportation. Older vehicles, in the context of emissions during vehicle operation, may be perceived as less sustainable than newly registered cars with lower emissions production during their lifetime.

The age of the vehicle fleet in the Czech Republic has shown a consistently increasing trend. In 2011, it was 15.36, and in 2022, the age of the vehicle fleet was 18.94. The latest data for the first two quarters of this year is already above the 19-year threshold, specifically 19.06 (Association of Automobile Importers, 2023b).

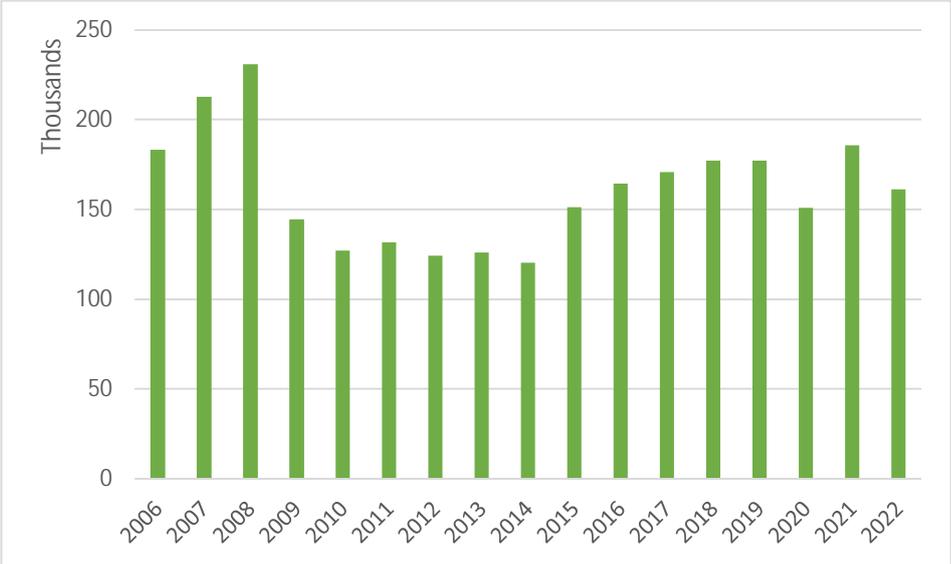


Figure 2. Used cars sales in Czech Republic. Source: processed data according to the Association of automobile importers (2022c)

The trend of buying used cars was more significant before the year 2010, as illustrated in Figure 2. However, even in recent years, the number of sold used cars has not fallen below the threshold of 150,000. This trend cannot be solely attributed to a sustainable transportation trend. Achieving sustainable transportation is possible based on four synergistic pillars: attractive public transportation, pedestrian accessibility, compact urban planning, and restrictions on car usage (Eliasson & Proost, 2014). Nevertheless, consumers themselves can significantly contribute by changing their mindset and preferences towards greener future.

Forms of sustainable transport

Czech regional and district agglomerations have long been grappling with traffic chaos, jams and congestion in general. The usual response is the construction of new roads, expansion of existing ones, and the building of bypasses. However, these measures often encroach upon arable land or green areas, posing threats to the health and safety of residents. Moreover, this trend encourages the growth of personal road traffic and an interest in private vehicles.

A sustainable solution, on the other hand, could involve promoting public, pedestrian, or cycling transportation (Stránský, 2022). The primary issue lies in the increasing number of cars. According to Healey (2022), various shared transportation options, such as shared cars, public transportation, shared bikes, or taxi services, could help reduce the number of owned vehicles. In his study, he also suggests another emissions reduction possibility—eliminating transportation altogether by embracing remote work.

The Czech ministry of transport is addressing the issue of traffic overload and chaos. It has responded to the European methodology SUMP (Wefering et al., 2014), which focuses on these strategic areas:

- Ensure that all residents have access to transportation options that allow them to reach key destinations and services.
- Enhance transportation safety.
- Reduce pollution, noise, greenhouse gas emissions, and energy consumption.
- Improve the efficiency of both passenger and freight transportation.
- Contribute to enhancing the attractiveness and quality of the urban environment for residents, the economy, and society.

The methodology of the ministry of transport of the Czech Republic, based on these strategic areas, has defined its visions and possibilities for their fulfilment, as shown in the following Table 1.

Table 1. Mobility vision

Mobility vision	Strategic goal	Specific goal	Measures and suitable activities (selection)
City with a high-quality living environment	Reduce the number of residents exposed to excessive noise by 20% within 10 years	Decrease noise load below the limit value on specific urban routes	Reduce driving speed; modernize public transport vehicles and infrastructure
City with safe transportation	Decrease the number of traffic accidents with serious injuries or fatalities by 50% within 10 years (EU target)	Reduce the number of accidents involving pedestrians at crossings and locations for crossing and cyclists at cyclist crossings by 50%	Add and improve pedestrian crossings and cyclist crossings; ensure visibility at crossing locations; a campaign focused on illuminating cyclists
City with quality public transport	Increase the share of public transport journeys by 3% within 10 years	Increase the number of public transport passengers on a specific route between the city center and residential area by 15%	Dedicated lane for public transport vehicles; preference for public transport vehicles at intersections; optimization of the timetable

Public transport, pedestrian, and cycling mobility are significantly supported in the context of the social aspects of sustainability. Safety, noise, or a high-quality living environment is a priority. Moreover, transportation significantly influences the economic

aspect – fuel prices, public transport fares, opportunities to purchase electric vehicles, or shared transportation.

The World Commission on Environment and Development (1987) defines sustainability as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It is necessary to ensure that the mobility of current generations does not excessively impact the mobility options of future generations.

2. Methodology

Sustainability in transportation has been the subject of interest for researchers addressing the project of the Student Grant Competition at the Škoda Auto University. Czech consumers and their attitudes or perceptions of sustainable transportation are crucial to describing consumer behavior. From a marketing perspective, it is an opportunity to effectively communicate sustainable principles in transportation by knowing their habits and beliefs. First, desk research was conducted to uncover important aspects of sustainable behavior in transportation via using data and published results from previous research surveys at the Škoda Auto University. The current factors of sustainable behavior in transportation were identified through the comparison of these results and the analysis of secondary data.

By defining the research gaps and identifying the basic attributes of sustainable transport behavior, the following research question was formulated: 'What is the sustainable transport behavior of Czech consumers in the context of using private cars, carsharing or public transport?' Answering this question can help to better understand the consumer, their attitudes, perceptions and needs. Also for this reason, attention is paid to differences between different age groups in their perception of sub-aspects of sustainable transport behavior, e.g. carsharing or preference for electric vehicles.

Subsequently, a questionnaire survey was organized in collaboration with the research agency BehavioLabs in February 2023. The research aimed to describe the sustainable behavior of Czech consumers in transportation based on established factors of sustainable behavior in transportation. First, based on the stated research objective, the operationalization was carried out in the context of the assigned topic of sustainability in transport. The key aspects were broken down into sub-topics so that the questionnaire met the requirements of clarity, readability and functionality, or relevance to the topic of the survey. The cooperating research agency has many years of experience in creating and distributing questionnaires and was a significant help in this phase to achieve relevant data and a representative sample of Czech respondents. A total of 1,000 completed questionnaires were used in data processing, with a quota selection of respondents based on the research agency's respondent panel ensuring the representativeness of the respondent sample, and the data from the questionnaire survey can be generalized.

The interpretation of the results in this chapter will focus on describing the use of cars by Czech consumers, its frequency, reasons for not using cars, and motives for driving. Attention will also be focused on car-sharing and the use of public transport. From the perspective of Czech consumer attitudes, the results of a survey section dedicated to the perception of different types of transport from an environmental perspective will be

presented. To complement the frequency analysis, contingency tables were developed to demonstrate the relationships between the age of respondents and the sub-aspects of sustainable transport behavior.

3. Results

3.1. Czech Consumers and their Car Usage

Transportation for most Czechs means using cars for their own mobility. Therefore, it was necessary to find out how much car transport is used by Czech consumers and potentially confirm this trend. From the graph in Figure 3, it is evident that a significant portion of the Czech population uses a car practically every day (48% of respondents). At least once a week, 261 out of 1000 respondents drive a car. Similarly, 13% of respondents stated that they drive a car once a month, less frequently, or not at all.

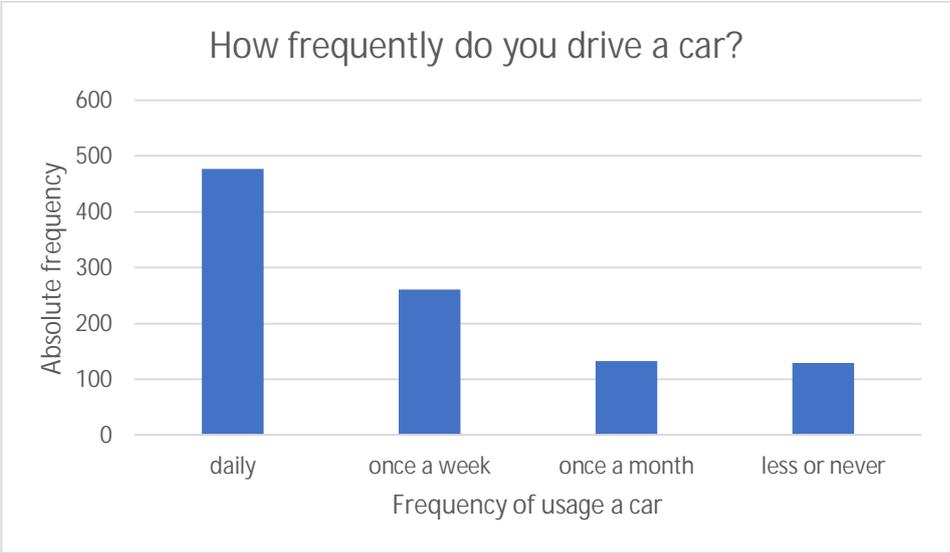


Figure 3. Frequency of car use

The next question was focused on the reasons leading respondents to limit car usage. The question was answered only by respondents who drive less frequently or once a month. The following graph in Figure 4 does not indicate that the ecological aspect plays a significant role in the decision to use a car. Only 48 out of 262 respondents answered that they want to save the environment. The financial aspect is addressed by 77 out of 262 respondents.

The use of car traveling was also examined from the perspective of why consumers use the car for. Respondents could choose multiple answers from the options provided. Three quarters (74%) answered shopping. For weekend trips to visit family, cottages, or excursions, 59% of respondents use a car. Similar percentages are reported for commuting to work and vacation travel (47% for work, 49% for vacation), which also corresponds to the responses regarding the frequency of car travel. Nearly 50% of respondents use a car every day, suggesting that transportation to work is a significant factor. 36% of respondents pick up children or family members by car, and only 22% use a car for work-related reasons (drivers, sales representatives, etc.)



Figure 4. Reasons for limited usage of car

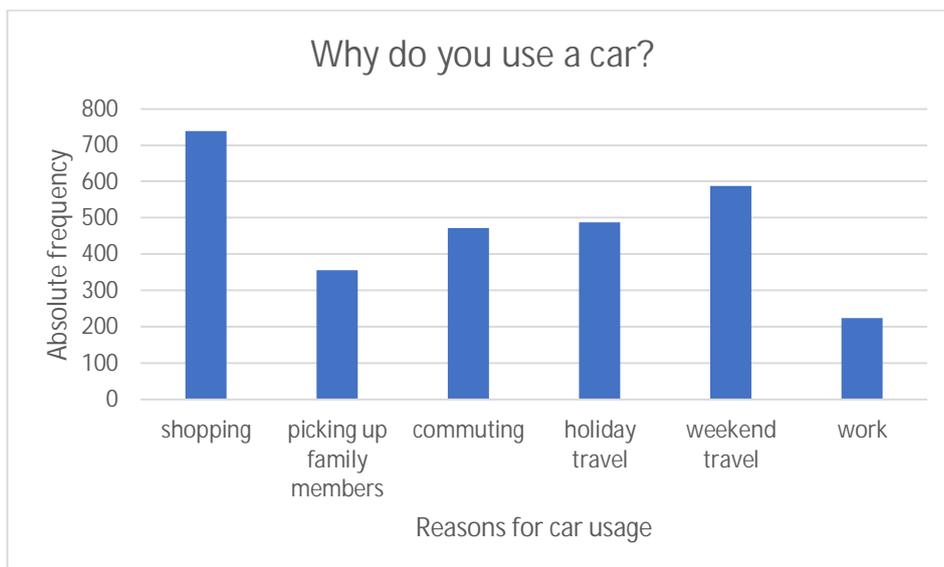


Figure 5. Reasons for car usage

From the above, it is evident that Czechs use cars frequently, mainly for their shopping or weekend trips. The reasons for their use outweigh the costs, and environmental considerations deter other, additional reasons.

3.2. Czech Consumers and Sustainable Transport

Sustainability in transportation is a trend addressed not only internationally but has been a subject of discussions on various levels in the Czech Republic for several years. The need for change is becoming increasingly prominent. Consideration is given not only to the elimination of car transportation but also to electromobility. These two directions were assessed in another questionnaire question. Consumer opinions on electromobility and other forms of transportation, in the context of their ecological impact, are crucial aspects for subsequent communication about electric vehicles.

As indicated by the graph in Figure 6, the train ranked as the most sustainable type of transport in the evaluation by Czech consumers. The ranking system is set from 0 to 5 (0 for the most sustainable type of transport, 5 for the least sustainable type of transport). Train was ranked on a first place by 408 respondents. In contrast, the least favorable rating, with an average of 4.725, was given to gasoline/diesel cars, followed by buses with an average ranking of 4.043. The electric car is perceived as highly ecological, ranked first by 304 respondents, with an overall average ranking of 2.991. In the Czech Republic, the number of newly registered electric vehicles is around 2%, and the first two quarters of 2023 indicate an increase to 3.15% of the total number of newly registered cars. While the percentage is growing, from the perspective of the European Union's direction, the goal is still quite distant. Significant sustainability factors, such as the purchase price of the vehicle or the inexperience of Czech consumers with electric cars, play a substantial role here. (Jaderná et al., 2018).

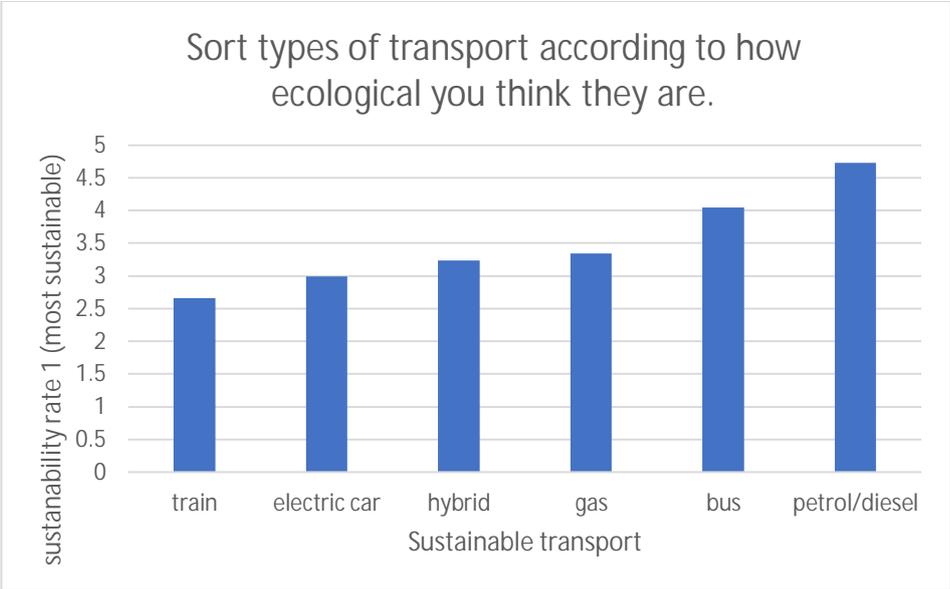


Figure 6. Types of transport sorted from the most sustainable to the least sustainable

The previous graph shows that electric cars are perceived as very environmentally friendly. But what is the interest in buying an electric car? The contingency table presented below compares the willingness to buy an electric car between different age categories. For clearer results, the answers have been converted into a relevant frequency, i.e. a percentage of the total number of respondents in the given age categories.

This shows that the two oldest age categories are the least interested. 19% of respondents aged 55-64 and 12% of respondents aged 65+ gave the answer maybe. Conversely, 43% of respondents aged 18-24 are considering buying an EV and absolutely not 50% of respondents aged 18-24 are considering it, compared to 78% of those aged 55-64 and 83% of those aged 65+.

Table 2. Buying of an electric car

Age Group	18-24	25-34	35-44	45-54	55-64	65+
Definitely	6%	6%	3%	5%	2%	2%
Maybe	43%	32%	32%	25%	19%	12%
Has	1%	0%	1%	1%	1%	3%
No	50%	62%	64%	69%	78%	83%

Shared mobility is one of a sustainable form of transportation. Carsharing is a car rental for a short period of time through a mobile application. The application locates an available vehicle at a specific address, and it can be reserved online. In the Czech Republic, there are already 1,890 cars operating in this mode (DopravaDnes.cz, 2023). However, the graph in the following image indicates a lack of interest from the Czech consumers in carsharing sphere. Out of 1,000 respondents, 768 do not use carsharing and have no interest, 171 of respondents express interest but have not used it yet. Only 13 people use carsharing frequently, and 48 use it occasionally. The question remains whether the reason is lack of interest or unfamiliarity with this alternative.

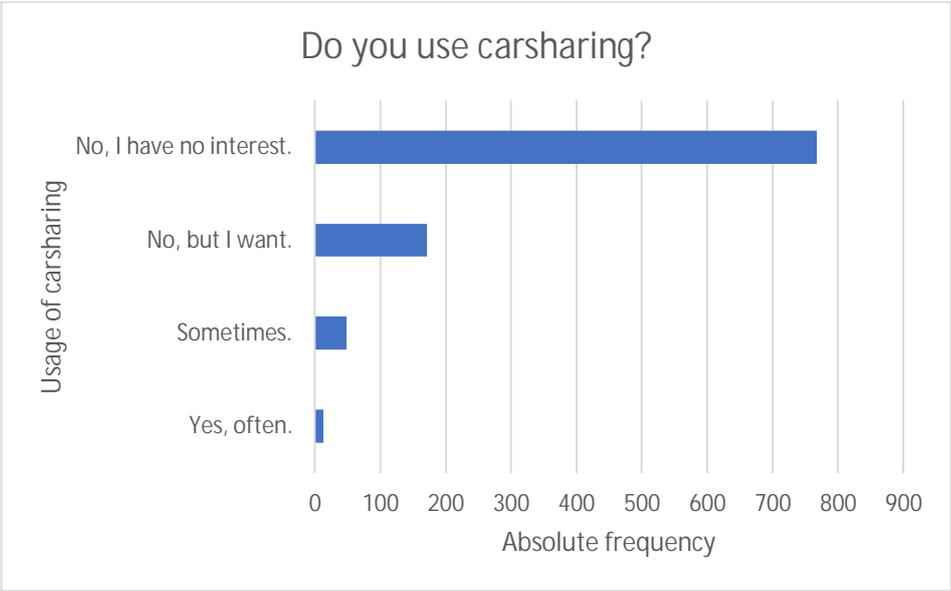


Figure 7. Carsharing usage

Again, the focus was on differences between generations. The contingency table shows that younger people are the most interested in using carsharing. 26% would like to use carsharing and 62% are not interested, but this is still the lowest number compared to other age groups.

Table 3. Usage of carsharing

Age Group	18–24	25–34	35–44	45–54	55–64	65+
Yes, often	4%	2%	2%	0%	1%	0%
Sometimes	8%	7%	6%	4%	2%	2%
No, but I want	26%	19%	19%	19%	8%	10%
No, I have no interest	62%	72%	73%	76%	89%	88%

The European Union, as part of its "Fit for 55" plan, extends the concept of climate neutrality to 2050. In this case, it is necessary to reduce greenhouse gas emissions in the transportation sector by 90% while ensuring accessible solutions for citizens (European Council, 2022). Addressing the carbon crisis requires a transformation not only of the industry itself but, more importantly, a change in attitudes, habits and behavior towards sustainable transportation. The following graph in Figure 8 illustrates the use of alternative modes of transportation other than cars in the Czech Republic.

782 respondents prefer walking instead of driving. 537 out of 1,000 respondents choose the bus, while 40% prefer trains. Tram, metro, or trolleybus is favored by 37%, and 31% opt for bicycles or scooters. Only 65 out of 1,000 respondents use a motorcycle or scooter. It is worth noting that people from various-sized cities answered the question. Nevertheless, the preference for walking is overwhelming.

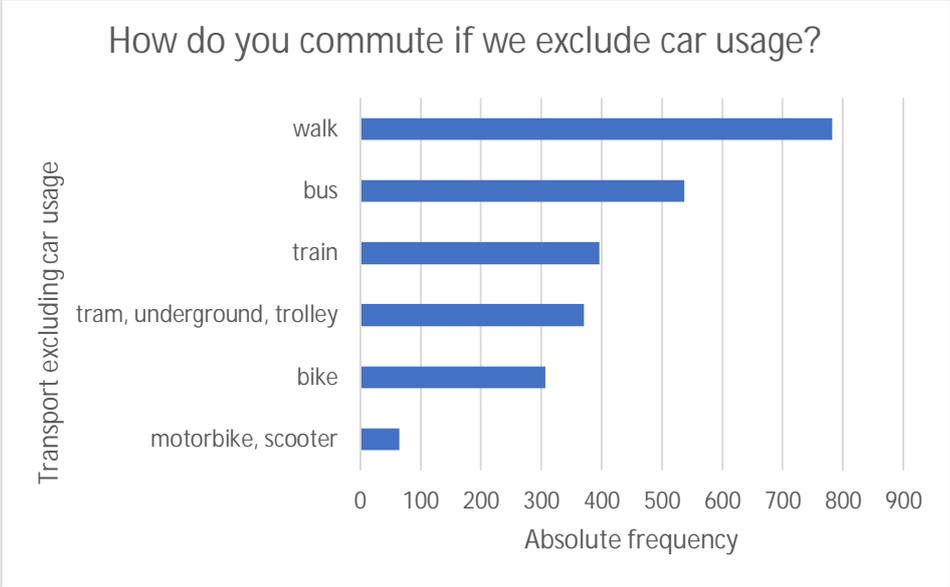


Figure 8. Alternative transport usage

Respondents were also asked whether they ever use public transportation, not only urban public transportation. All respondents answered this question, and the results indicate that more than 40% of Czechs do not use public transportation at all or less than once a month. This response corresponds to the figure of 48% of respondents who drive a car every day. 245 out of 1,000 respondents use public transportation essentially every day, and the same percentage of respondents, 17%, stated that they use public transportation at least once a week or once a month.

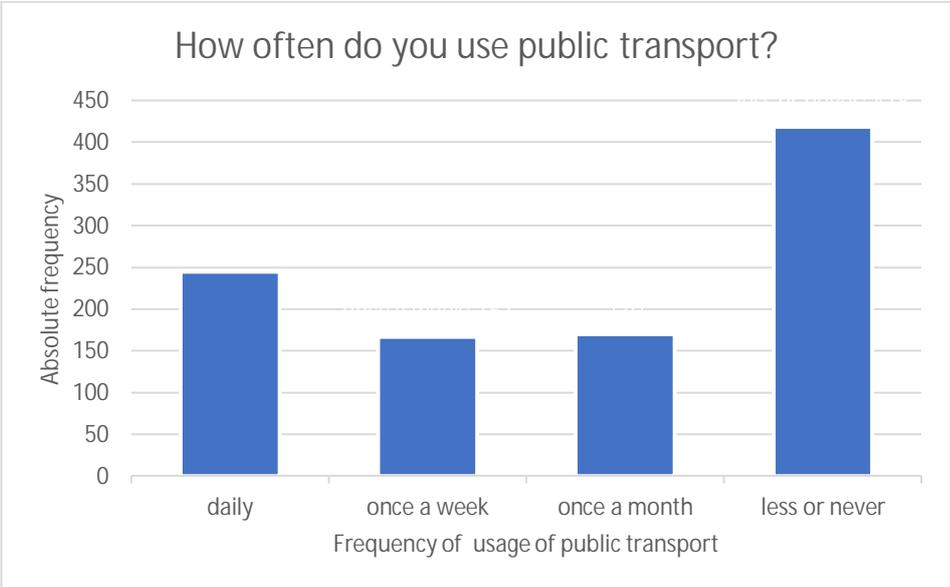


Figure 9. Usage of public transportation

The reason why Czechs use public transportation less frequently is primarily because the connections do not suit them or are infrequent, as indicated by 37% of all respondents. Another significant reason is that it is often overcrowded (stated by 32% of respondents). The time aspect is a problem for 29% of respondents in the case of public transportation. Other reasons fall below the 20% threshold and include discomfort, lack of hygiene, or the bus or tram stop being too far away. Additionally, 10% of respondents mentioned that it is too expensive for them.

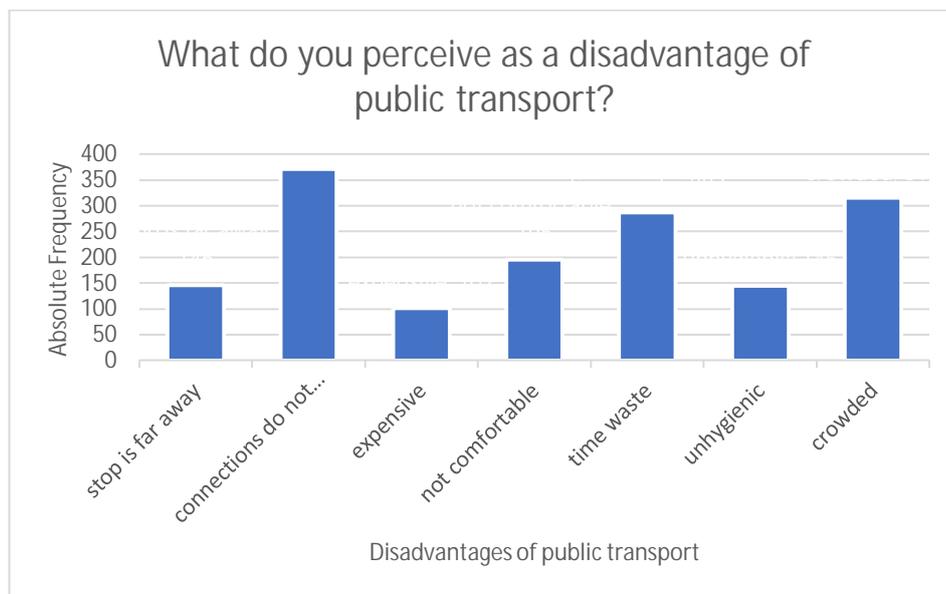


Figure 10. Struggles with public transport

Environmental aspects of sustainable transport should be supported regarding the social and economic dimensions of consumer decisions. The Triple Bottom Line, with its pillars, as well as other definitions of sustainability, look not only at environmental protection. If using public transportation is not realistic due to poor connections or its time constraints, it is necessary to focus attention not only on the environmental sustainability of the consumer but especially on improving other transportation alternatives. Above all, it is essential to ensure affordable transportation that meets frequency requirements, accessibility and financial availability.

4. Discussion

Sustainability is perceived diversely by Czech consumers concerning various needs and the products they purchase. When it comes to lower-priced products or everyday consumer goods, the situation differs from the purchase of higher-priced automobiles. Sustainable principles are more frequently followed in everyday consumption; however, sustainable personal road transport, such as electric cars, remains a significant challenge for them. On the other hand, in the context of sustainable transportation, there is talk of using car-sharing, public transport, or completely restricting to walking or cycling. These alternatives differ in terms of purchase price from buying a car, but long-term support from the state (primarily infrastructure development) is necessary.

Knowledge of the customer and their consumption behavior is crucial for marketing communication decisions. Similarly, knowing consumer preferences in transport is important for strategic planning at the regional or national level. In the context of understanding consumer behavior in the transport sector, research gaps have been identified with regard to the results of a longitudinal study at Skoda Auto University in the context of the student grants.

Significant attributes of sustainable transport include a lower frequency of car use, on the contrary the use of carsharing, public transport and an inclination towards electromobility. All these aspects were examined in the context of the research question: "What is the sustainable transport behavior of Czech consumers in the context of using private cars, carsharing or public transport?"

Czech consumers do not behave very responsibly in terms of sustainability in transport. More than 78% of respondents drive a car every day, mainly to do their shopping or go on trips. According to the perception of the Czech consumer, the most environmentally friendly mode of transport is the train, followed by electric cars. However, interest in buying an EV is low. The researchers were interested in the younger generation, which often tends to be more inclined towards sustainable principles. In this context, a higher inclination to buy an EV was confirmed, but also a greater interest in carsharing. The latter is uninteresting for older generations.

This raises the question to what extent the younger generation can reverse the current trends in sustainable transport behaviour of Czech consumers. It is clear that marketing communication of EVs in terms of green transport is effective. Other communicated aspects of sustainability, such as carsharing, public transport, are equally effective, especially for the young generation. Marketing support can therefore be a solution. However, a major barrier to the use of carsharing or public transport is its availability. The most important factor for public transport is considered to be that the services are not connecting or are overcrowded.

This is more than a challenge for marketers, it is a challenge for county and state representatives in transportation infrastructure planning.

5. Conclusions

Sustainable transportation is a challenge not only for legislators, businesses, and philanthropists but significantly impacts daily life of consumers. Embracing new sustainable trends must go hand in hand with fulfilling common needs. It is, therefore, necessary to consider the social and economic impact of decisions to adhere sustainable principles. A significant portion of Czech consumers still predominantly relies on automotive transportation, with 48% daily usage. Most people use cars for shopping and weekend getaways. The reduction in car usage is not supported by statistics on the registration of new and used cars. On the contrary, the age of vehicles is increasing, exceeding emission limits more frequently.

Sustainability in transportation can be achieved through various forms. One of them is using the most ecological mode of transportation possible. According to Czechs, the most environmentally friendly option is the train, followed by electric cars. Czech consumers consider a car with an internal combustion engine and bus transportation the least ecological. Carsharing is currently unattractive for Czechs; only a negligible percentage uses it, although there are already 1890 cars available through this service in the Czech Republic. However,

there is hope for growing interest in this service, especially among the younger generation of Czech consumers (Bělohávková, 2021). In addition to cars, Czechs are making efforts to walk as much as possible or use buses and trains. Almost 25% of respondents use public transportation daily, while on the other hand, more than 40% do not use public transportation at all or less than once a month. The main reasons are the lack of connections between routes or overcrowding. Additionally, the time factor is crucial, as public transportation is usually more time-consuming.

In the long term, it will be desirable to draw attention to alternative forms of transportation, such as carsharing. Importantly, it is crucial to ensure sufficient capacities of public transportation that are both affordable and time friendly. Another milestone is promoting walking through the construction of new paths, crossings, and overpasses, rather than focusing on building more roads and bypasses. Furthermore, automakers will compete for every customer purchasing an electric vehicle in the Czech market. Due to product unfamiliarity and excessively high acquisition costs, electric cars are still unattractive. These are the challenges that supporters of sustainable transportation will face.

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