

## CARPOOLING AND NATURAL RESOURCE PROTECTION: SHARED TRANSPORT USERS' PERSPECTIVE

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**Purpose:** This article aims to explore users' willingness to share with others and relinquish ownership. It also investigates whether these attitudes notably impact the adoption of shared carpooling and the imperative to preserve natural resources in the environment.

**Design/methodology/approach:** This research was conducted through a survey questionnaire among users of social networks that focus on shared travel, ecology, anthropological climate change and the environment.

**Findings:** 'Residence' impacts the inclination to share and relinquish ownership for environmental conservation. Conversely, 'gender' and 'age' don't significantly affect consumer attitudes. Acceptance of carpooling hinges on 'ease', 'usefulness', and 'economic value' for those open to sharing. Additionally, 'perceived development' matters for those willing to forgo ownership. Conservation concerns arise among advocates of 'sustainable consumption', 'eco-friendly business practices', and 'alternative' options in carpooling. Giving up ownership ties to both 'sustainable consumption' and 'social-economic attitudes' aligned with resource conservation.

**Research limitations/implications:** The research focused on two attitudes affecting consumer behavior in terms of acceptance of carpooling transportation and the need to protect environmental natural resources. Therefore, it is necessary to study further the reasons that confirm the validity of carpooling activities and the particular need to care for the environment.

**Practical and social implications:** The findings underscore the importance of advocating for sharing and relinquishing ownership to safeguard natural resources. Heightened awareness and comprehension of the repercussions of personal choices in business and social spheres are crucial. This article significantly contributes to the movement toward conserving natural resources by advocating for thrifty and health-conscious lifestyles, along with conscientious and effective resource utilization.

**Originality/value:** The article provides an understanding of the reasons for accepting carpooling transportation and the need to protect natural resources. It highlights the significance of collaborative efforts that yield benefits for both people and the environment.

**Keywords:** carpooling, natural resource protection, acceptance, sharing, and giving up ownership.

**Category of the paper:** Research article.

## 1. Introduction

Given that global car production is expected to increase by 12.1% (Goldman Sachs, 2022), and global road emissions are expected to double by 2050 (Forsal.co.uk, 2021), it becomes clear that sustainable travel is a key element in developing alternative modes of transportation to minimize the environmental impact of cars. Among various transportation solutions, carpooling, or traveling together, is emerging as a practical measure to solve the problems of congested streets and atmospheric carbon pollution (Cui et al., 2021; Shaheen, Cohen, 2019; Furuhashi et al., 2013; Neoh et al., 2017). However, it is noteworthy that the effectiveness of carpooling depends on several factors, including the availability of carpooling options, the degree of community organization and willingness to cooperate, attitudes toward ownership, propensity to share, and the transportation infrastructure of a region (Garrison et al., 2011; Neoh et al., 2017). Despite proven potential benefits such as environmental benefits, economic savings and social benefits (Greene, Wegener, 1997; Gärling, Steg, 2007; Kelley, 2007; Chan, Shaheen, 2011; Morency, 2007; Shaheen et al., 2016), carpooling still faces psychological and personal barriers to its acceptance (Morency, 2007; Olsson et al., 2019; Correia, Viegas, 2011). But in recent years, the emergence of online platforms and applications that facilitate communication and resource sharing has resulted in rapid growth and increased propensity for carpooling, both in daily life and for long-distance travel (Shaheen et al., 2017; Ganapati, Reddick, 2018; Furuhashi et al., 2013; Gardner, Abraham, 2007). These changes can be combined with a growing demand for natural resource conservation both among ordinary people and in international and governmental organizations around the world, such as Greenpeace, the United Nations Environment Program (UNEP), the World Wildlife Organization (WNO), the World Environmental Organization, or the Intergovernmental Panel of Experts on Climate Change (IPCC), or the Commission on Environment, Natural Resources and Forestry (OSZ), whose activities are focused on environmental protection (Eccarius, Lu, 2020; Canning et al., 2010; Park et al., 2012; OSZ, 2023; Thpanorama, 2023). The problem of the inability to restore used natural resources and protect those that have not yet degraded has become one of the main challenges of our time (Thpanorama, 2023). In light of this, given the preservation of natural resources, initiatives such as carpooling seem to be both a logical and necessary step towards promoting this form of transportation among the public.

This article examines users' propensity to share with others and their willingness to give up possessions for the common good. In addition, it examined whether these attitudes translate significantly into acceptance of carpooling and a general understanding of the need to conserve natural resources.

## **2. Carpooling and the environment - factors supporting the acceptance of this type of transport and the need to protect natural resources**

### **2.1. Understanding carpooling transport**

A literature review allows us to track the evolution of such initiatives within the sharing economy (Belk, 2014; Hofmann et al., 2019). Carpooling most often describes a situation in which a driver shares his car with people not members of his household to make a trip (or part of a trip) over a short or long distance he has already planned. Carpooling can be free or based on cost sharing (Cui et al., 2021; Shaheen, Cohen, 2019; Furuhata et al., 2013; Aguiléra, Pigalle, 2021). It should be noted that carpooling differs from ridehailing, in which people use professional or part-time drivers through mobile apps and pay for the ride (Tirachini, 2020). In carpooling, the driver is usually an individual who decides to travel together with other people, sometimes for free and sometimes with cost sharing, such as the cost of fuel. Also, carpooling is not the same as carsharing, where users can access vehicles for a specified period but do not own them (Lagadic et al., 2019). It's also worth noting that carpooling encompasses various categories and is subject to multiple classifications in the literature (Neoh et al., 2017). These categories often relate to the purpose of the trip (work-related or private), the method of connecting drivers and passengers (whether based on technology or haphazard), and the relationship between driver and passengers (whether or not they are related in the same household) (Shaheen, Cohen, 2019).

In this article, carpooling is not limited to a specific arrangement type, such as home carpooling or business carpooling, nor does it consider restrictions related to the relationship type between passengers and drivers (i.e., people who are professionally or casually related).

The carpooling approach in this paper is based on the very fact of willingness to share and give up ownership of one's means of transportation as long as one's immediate environment makes it possible to share transport with others (Adelé et al., 2012). It's important to understand that this mode of travel has a positive impact on the environment but also carries benefits for the user, both economically and socially (Greene et al., 1997; Gärling, Steg, 2007).

Therefore, in the remainder of the article, "carpooling" refers to joint car trips by people who are not necessarily bound by specific relationships or destinations and who choose to travel together, already planned by the driver, without profit (although travel costs may be shared). Both business and private trips are considered, whether technology-based or ad hoc.

### **2.2. Carpooling as an environmental strategy**

Carpooling is one of many strategies to reduce the environmental impact of transportation. Other related initiatives include using public transportation, bicycling, walking trips, and developing cleaner vehicle technologies such as electric or autonomous cars (Ma et al.,

2018; Kim, Kim, 2020). All of these activities are important for conserving natural resources and reducing the negative environmental impact of transportation.

Carpooling is currently interesting to researchers and public authorities (Delhomme, Gheorghiu, 2016; Gheorghiu, Delhomme, 2018). It is considered a relatively inexpensive option for reducing the number of cars and single-passenger vehicles, a major environmental challenge contributing to traffic congestion and air pollution (Wicki et al., 2019). Reducing traffic congestion positively relieves traffic jams, leading to time savings and lower emissions (Greene, Wegener, 1997; Gärling, Steg, 2007). In addition, fewer cars on the road result in less demand for parking spaces, which contributes to reducing the need to build parking lots and asphalt, which positively impacts the environment. Carpooling can also help increase people's environmental awareness and encourage them to make more sustainable transportation choices (Aguiléra, Pigalle, 2021; Gheorghiu, Delhomme, 2018).

The literature also describes barriers to carpooling (Olsson et al., 2019). Research has shown that the impact of carpooling on travel behavior, particularly owning and using one's own car, is inconclusive (Shaheen et al., 2016; Concas, Winters, 2007; Javid, Al-Khayyat, 2021). Nevertheless, IT-based carpooling, using platforms and apps, and changes in society's lifestyles are contributing to the renewed popularity of this form of transportation, as in the case of Blablacar (Shaheen et al., 2017; Furuhata et al., 2013).

### **2.3. Willingness to share and give up ownership for ownership as factors in carpooling use**

Research on factors influencing individual carpooling decisions points to various levels of categorization, such as socio-demographic, psychological, spatial, and temporal, based on car availability and attitudes (Buliung et al., 2010; Arbour-Nicitopoulos et al., 2012; Neoh et al., 2017; Gardner, Abraham, 2007). These factors can be categorized as internal to the person using carpooling. Intrinsic factors relate to the individual characteristics of each carpool user, including demographics, while evaluation factors relate to thoughts on the benefits of carpooling. External factors, on the other hand, connect to the carpooler's environment, along with the influence of third parties, such as political regulations that facilitate carpooling and situational factors related to location. Factors with internal origins significantly impact the propensity to share with others and the willingness to give up possession for ownership. They significantly impact the evolution of carpooling users' consumption habits (Neoh et al., 2017). As the sharing economy services have grown (Shaheen et al., 2016; Concas, Winters, 2007; Javid, Al-Khayyat, 2021), habits have become more noticeable. Customers have shifted their focus from buying new products and services to a greater appreciation of sharing and reusing these goods (Rong et al., 2021; Jeon et al., 2020). The modern consumer is no longer limited to owning things, he is more interested in access to products and services (Falcone, Imbert, 2017). This phenomenon is confirmed by Hamari et al.'s (2016) research on young

people involved in the sharing economy and their intentions to actively participate in this consumption model (Hamari et al., 2016).

Awareness and knowledge of the sharing system and environmental values influence intentions to carpool (Eccarius, Lu, 2020). Lack of incentives or motivation can be an obstacle to encouraging people to use sharing (e.g., lack of recognition of such behavior, lack of enjoyment or good reputation) (Goldstein et al., 2008; Hamari et al., 2016). Attitudes toward sharing consumption may influence intentions to participate in such activities, but its impact may be less when people consider actual participation rather than just declarations (Hamari et al., 2016). Therefore, there is a need for further research in this area, as attitude does not always translate into user behavior, although it is a significant factor in changing it (Ajzen, 1991).

#### **2.4. Acceptance of carpooling transport**

The acceptance level of carpooling depends on many factors influencing the decision to use this form of transportation. The user needs to be able to evaluate this form of transportation as valuable. Based on a review of the literature, it is possible to identify several factors that can influence the development of trust in carpooling services (Gardner, Abraham, 2007; Neoh et al., 2017). Here are some of these values:

- perceived ease of use refers to the degree to which carpooling services are considered easy (Venkatesh et al., 2012; Van der Heijden, 2004). The easier the service is to use, the more value and trust it generates for the user (Kim et al., 2009). Thanks to mobile apps and social networks, consumers can now order carpooling services and more easily find suitable co-passengers (Dinesh et al., 2021; Adélé, Dionisio, 2020; Cheng, et al., 2020). Perceived ease of use is a key factor in the acceptance and use of carpooling services, and increases trust in the service provider.
- perceived usefulness, which refers to the effectiveness of carpooling in achieving individual user goals (Venkatesh et al., 2012; Van der Heijden, 2004; Deci et al., 1999; Ma et al., 2018). Users expect that carpooling will allow them to achieve their goals, such as saving on travel costs, moving around comfortably, or living according to their beliefs, such as environmentally. Carpooling also makes it possible to meet new people influences consumers' decisions to accept or continue using this type of transportation solution (Kim et al., 2009; Dueker et al., 1977).
- perceived economic value, which is based on assessing the costs and benefits of carpooling. If the benefits of doing something outweigh the prices to be incurred, a high level of value is perceived (Sweeney, Sou, 2001; Kim, Han, 2009; Kim, 2012). Consumers are inclined to choose the option that allows them to maximize value. Saving travel costs is a significant motivator for carpooling, as it minimizes the costs associated with a private car (Canning et al., 2010; Washbrook et al., 2006).

- perceived intangible value, which includes motivations such as environmental protection, healthy lifestyles, and the opportunity to make new friends (Ben-Elia, Zhen, 2018; Arteaga-Sánchez et al., 2020; Canning et al., 2010). These motivations influence consumer behavior, continued use of carpooling services, and build trust in this type of service.
- continuation intention refers to a user's attitude toward repeated shared consumption (Hamari et al., 2016). Carpooling users often use the service to reduce congestion on the roads, reduce their carbon footprint, etc., suggesting that environmental and ethical frameworks may influence their decisions (Canning et al., 2010; Collura, 1994). For example, 55% of respondents agree that they should reduce driving for environmental reasons (Park et al., 2012). However, the intention to continue may be distorted by privacy risks or a sense of security (Correia, Viegas, 2011; Park et al., 2012; Davis, 1989).
- perceived development refers to identifying areas where carpooling has growth potential. Aguiléra and Pigalle (2021) highlight low-density regions in their work. In these areas, for both environmental and social reasons, mobility challenges will be most significant in the coming years, especially for public authorities. Average distances, car ownership, and use are more common there than in urban areas (Aguiléra, Pigalle, 2021). Carpooling can complement public transportation (Le Vine, Adamou, 2014).
- trust in the service provider refers to the belief that the service provider will act according to the user's expectations and not engage in opportunistic behavior. This trust is key in building lasting relationships and influences decisions to carpool again (Kim, 2019). It is worth adding that trust in the service provider is closely linked to protecting user data privacy. Improper or illegal use of customers' information without explicit consent reduces confidence in this type of transportation and can deter users from reusing the service (Wu, Kim, 2019).

## 2.5. Consumers' attitude to natural resource protection

The need to protect natural resources is a crucial argument to justify promoting and accepting carpooling activities. The popularization of carpooling can reduce transportation's negative impact on the environment. However, achieving this goal requires a comprehensive approach to environmental protection at various levels, including international, EU, national, and social units. People's attitude toward protecting natural resources is essential to guarantee humanity's future (Thpanorama, 2023; Zębek, 2017).

A social unit's (consumer's) attitude toward the conservation of natural resources may result from various internal or external factors. A social unit may strive or expect others to, for example:

- sustainable consumption, or rather the opportunity to be a sustainable customer who has adopted the LOHAS (Lifestyles of Health and Sustainability) lifestyle as their responsibility (Lubowiecki-Vikuk et al., 2020; Choi, Feinberg, 2021). The environment, health, sustainability, and social justice are important for their representatives. They are considered "culture makers," "conscious consumers," or "change seekers" (French, Rogers, 2010; Jayaratne et al., 2017). They seek to protect themselves and their world through sustainable purchasing decisions (Ottman, 1993). They emphasize the need for obvious environmental protection (Lubowiecki-Vikuk et al., 2020). Admittedly, research shows that consumers do not always follow through with what they declare; namely, while declaring environmental values in their daily lives, they do not demonstrate this in their actual purchases. Consumer behavior is complex, as many factors influence the final purchase decision, such as cost, purpose, availability, and alternative options (Sharpley, 2001; Moisander, 2007).
- sustainable actions by companies that actively offer social benefits or public services and voluntarily minimize harmful environmental and societal practices (Lubowiecki-Vikuk et al., 2020; Vitell, 2015). This approach results from CSR (Corporate Social Responsibility) or CSV (Creating Shared Value) activities. Companies that implement sustainable practices can benefit from building a good image and increasing profitability (Leib&Leib, 2010). These activities must be carried out with consumer participation, include social, environmental, and economic aspects, and are seen as developing solutions that meet everyday needs without compromising the ability of future generations to meet their own needs (Lubowiecki-Vikuk et al., 2020; Ramirez et al., 2014).
- valuable alternatives that allow you to make purchases based on your beliefs, especially those related to a moral sense of belonging to the environment. Such choices lead to deeper self-understanding, self-realization, and personal growth (Kettemann, Marko, 2012). Being able to choose environmentally friendly products or services is a sense worth embracing despite the cost (Moisander, 2007). The customer personally sees the benefit of the amount paid. The availability of such alternatives can lead to a change in consumer behavior. In general, a lack of alignment between values and purchasing decisions can influence the avoidance of carpooling (Eccarius, Lu, 2020).
- developing social and economic attitudes based on a local or global framework of environmental and ethical issues to build social beliefs. Examples include giving up property ownership and instead sharing with others, which helps reduce carbon emissions (Collura, 1994; Canning et al., 2010). This can also include monitoring product production, sale, consumption, and disposal to ensure minimal environmental impact (Yeh, Chen, 2011). Emphasize the importance of recycling and biodegradation (Choi, Feinberg, 2021). Develop a preference in society to buy products from companies with social values similar to those they declare (Pícha, Navrátil, 2019).

- ecological/environmental awareness (attitude) of individuals and entities in the environment. An ecological approach to life includes reducing consumption of the earth's natural resources and one's resources. Individuals with such attitudes seek to contribute to reducing their carbon footprint by changing transportation and reducing energy consumption (Park et al., 2012). They are important because research confirms a positive relationship between pro-environmental attitudes and the willingness to change one's behavior (Kilbourne et al., 2002). Environmental security is a basic need for society (Zębek, 2017).

### 3. Methods

#### 3.1. Structure of respondents

A total of 101 respondents took part in the survey. The survey group comprised 52.5% women (53 people) and 47.5% men (47). Residents of towns with populations between 101,000 and 500,000 were the largest group, accounting for 26.7% of the total. In order of importance were residents of cities with a population of less than 10,000 (23.8%) and less than 500,000 (22.8%) Table 1. The largest group was young adults between 18 and 24, accounting for 57.4% of the respondents. This result is also confirmed by the literature, where it is indicated that it is mainly younger people who are willing to use shared transportation services and are active users of the Internet and mobile applications (Ganapati, Reddick, 2018; Shaheen, Cohen, 2019; Bielinski, Ważna, 2020; Guo, Zhang, 2021; Suchanek, Szmelter-Jarosz, 2019; Globalwebindex, 2017; Standing et al., 2018; Rayle et al., 2014). It is worth noting that the study also includes minors, who can participate in the type of transportation with their guardian's consent (Blabla.com, 2023).

**Table 1.**

*Structure of the survey sample*

Residence size	Female	Male	Total (N)	%
Less than 10 thousand residents	15	9	24	23.8
10 - 50 thousand residents	6	8	14	13.9
51 - 100 thousand residents	5	8	13	12.9
101 - 500 thousand residents	14	13	27	26.7
More than 500 thousand residents	13	10	23	22.8
Total (N)	53	47	101	100
%	52.5	47.5	100	x

Source: own research. N-sample surveyed.



### 3.2. Method and measurement tool

The research was conducted using an electronic survey questionnaire (CAWI - Computer Assisted Web Interviews) among social media platform users related to carpooling (such as BlaBlaCar, inonecar, and JedziemyRazem.pl), ecology, and issues of anthropogenic climate change and environmental protection. It was conducted in May 2023 and is a declarative survey.

The survey questionnaire included closed questions and used a nominal and ordinal scale (Likert 1-7). The items assessed to respondents were developed based on a review of the literature, which was briefly presented in the earlier discussion. The results were analyzed using PS IMAGO PRO 6 software and IBM SPSS Statistics 28. Data were subjected to frequency analysis, non-parametric tests such as the Mann-Whitney U test and Kruskal-Wallis test, and the Spearman rank correlation coefficient (rho-Spearman) was used (Grzeszkiewicz-Radulska et al., 2020).

### 3.3. Purpose of the survey and research questions

This study aimed to understand participants' attitudes toward carpooling and their attitudes toward activities based on sharing with others and giving up their possessions in the context of the need to conserve natural resources.

They prepared the following research questions:

RQ1: How do respondents relate to the idea of sharing to conserve natural resources, considering different profiling variables of respondents (gender, age, or residence)?

RQ2: How does participants' willingness to give up individual ownership in favor of shared access to goods and services affect their attitudes toward natural resource conservation, given the differences between groups according to respondents' profiling variables (gender, age, residence)?

RQ3: Does willingness to share with others matter for:

- A. overall acceptance and evaluation of carpooling solutions?
- B. overall perception of the need to conserve natural resources?

RQ4: Does respondents' willingness to give up individual ownership in favor of shared access to various goods and services significantly affect their opinion regarding:

- A. general acceptance and evaluation of carpooling solutions?
- B. the overall perceived importance of natural resource conservation?

## 4. Findings

Because of research question RQ1, we can conclude that the variables, i.e., 'gender' ( $U = 1180$ ;  $p = 0.520$ ;  $\alpha = 0.05$ ) and 'age' ( $H = 7.493$ ;  $p = 0.112$ ;  $\alpha = 0.05$ ) do not show significant

differences in the aspect of sharing with others through the lens of natural resource conservation. In contrast, the variable 'place of residence' showed statistically significant differences between the study groups ( $H = 12.586$ ;  $p = 0.013$ ,  $\alpha = 0.05$ ). The analysis for this variable identified three groups of respondents, indicating that those living in areas with populations between 101,000 and 500,000 ( $Mrang = 53.85$ ), above 500,000 ( $Mrang = 57.15$ ), and below 10,000 ( $Mrang = 57.83$ ) are more in agreement with the statement "that sharing with others positively affects natural resource conservation" than those in areas with populations between 10,000 and 50,000 ( $Mrang = 27.36$ ) (Table 2). We can surmise that larger cities face higher pollution levels, but residents' awareness plays a key role in preventing the degradation of natural resources.

**Table 2.**

*Nonparametric test results for research question RQ1 and RQ2*

Nonparametric test	Variable	RQ1	RQ1	RQ2	RQ2	
		Value	Significance (p)*	Value	Significance (p)* Value	
U Manna-Whitney'a for independent samples	Gender	U = 1180	0.520	U = 1375	0.464	
H Kruskala-Wallis for independent samples	Age	H = 7.493	0.112	H = 2.441	0.655	
H Kruskala-Wallis for independent samples	Residence	H = 12.586	0.013*	H = 13.298	0.010*	
<b>RQ1 Groups for the variable 'residence':</b>				<b>RQ2 Groups for variable 'residence':</b>		
Group 1: Group of 101-500 thousand residents ( $Mrang = 53.85$ ) from 10-50 thousand residents ( $Mrang = 27.36$ ).		D** = -26.49	0.048*	Group 1: Group of 101-500 thousand residents ( $Mrang = 57.17$ ) from 10-50 thousand residents ( $Mrang = 26.00$ ).	D** = -31.167	0.007*
Group 2: Group of over 500 thousand residents ( $Mrang = 57.15$ ) from 10-50 thousand residents ( $Mrang = 27.36$ )		D = -29.795	0.021*	Group 2: Group of over 500 thousand residents ( $Mrang = 55.13$ ) from 10-50 thousand residents ( $Mrang = 26.00$ )	D = -29.130	0.022*
Group 3: Group of less than 10 thousand residents ( $Mrang=57.83$ ) from 10-50 thousand residents ( $Mrang=27.36$ )		D = 30.476	0.015*	Group 3: Group of less than 10 thousand residents ( $Mrang = 54.46$ ) from 10-50 thousand residents ( $Mrang = 26.00$ )	D = 28.458	0.025*

\* $\alpha \leq 0.05$ ; \*\*D = Dunn's test.

Source: own research.

On the other hand, referring to question RQ2, we can conclude that the variables, i.e., 'gender' ( $U = 1375$ ;  $p = 0.464$ ;  $\alpha = 0.05$ ) and 'age' ( $H = 2.441$ ;  $p = 0.655$ ;  $\alpha = 0.05$ ) do not show significant differences in the willingness to give up ownership of something when there is free access to various goods and services. In contrast, the variable 'place of residence' showed statistically significant differences between the study groups ( $H = 13.298$ ;  $p = 0.010$ ;  $\alpha = 0.05$ ). The analysis for this variable identified three groups of respondents, indicating that those living in areas with populations of 101,000 to 500,000 ( $M_{rang} = 57.17$ ), above 500,000 ( $M_{rang} = 55.13$ ) and below 10,000 ( $M_{rang} = 54.46$ ) are more in line with the statement "that there is a tendency to give up ownership of something when there is free access to various goods and services" than those from areas with populations of 10,000 to 50,000 ( $M_{rang} = 26.00$ ) (Table 2). It can be assumed that larger cities offer more diverse access to various goods and services compared to smaller areas of residence. However, opting out is not solely due to accessibility but often due to the user's level of awareness of the possibilities and benefits of doing so, both for themselves and society.

An analysis using Spearman's rank correlation coefficient (rho-Spearman) was conducted to identify significant statistical differences in the context of research question RQ3, which relates to the relationship between respondents' propensity to share with others and their overall acceptance and evaluation of carpooling solutions and the need to protect natural resources (Table 3).

The rho-Spearman analysis showed positive correlations between the variable "espondents' willingness to share with others to protect natural resources" and three specific aspects of carpooling acceptance (Table 3. RQ3. A; item numbering as shown in the table):

1. perceived ease of carpooling ( $\rho = 0.308$ ): There is a clear but low positive ( $0.2 < \rho \leq 0.4$ ) relationship between positive perceptions of carpooling and willingness to share transportation for environmental good. People who readily accept carpooling and see the value of using it are more likely to engage in environmental activities through transportation sharing;
2. perceived usefulness of carpooling due to conservation of natural resources ( $\rho = 0.315$ ): There is a clear but low positive relationship between perceptions of carpooling as a useful initiative for the environment and willingness to share. Those who perceive carpooling as applicable for natural resource conservation are more likely to say they are willing to share a vehicle with others;
3. perceived economic value of carpooling ( $\rho = 0.351$ ): There is a moderate ( $0.4 < \rho \leq 0.7$ ) positive relationship between seeing financial savings in carpooling and willingness to take action for the environment through transportation sharing. People who see potential savings in carpooling are more likely to take action to protect natural resources.

Next, the rho-Spearman correlation analysis was undertaken between the variable "respondents' willingness to share with others" and the need to protect natural resources. Positive correlations were identified between the four variables (Table 3. RQ3.B; item numbering as shown in the table):

1. protecting depleting natural resources as a priority for sustainable consumption: The correlation value is  $\rho=0.533$ , indicating a moderate positive relationship between these variables. People who are willing to share with others in the context of natural resource conservation tend to consider natural resource conservation a priority due to its crucial role in meeting basic needs;
2. pollution reduction and sustainable consumption: the correlation value is  $\rho = 0.341$ , indicating a moderate positive relationship. People who are positive about sharing to conserve natural resources tend to be more accepting of sustainable consumption and caring for the environment, including reducing gas emissions and changing lifestyles;
3. companies' environmental activities: The correlation value is  $\rho = -0.272$ , indicating a clear but low negative correlation. Those inclined to share for the sake of the environment may be more skeptical about the intentions of companies and brands in their environmental activities. They often consider companies' actions for the environment to be incidental or indirectly driven by motivations related to trust risk or the company's profit goal;
4. lack of sufficient alternatives: The correlation value is  $\rho = 0.218$ , indicating a weak positive relationship. Those willing to share for the sake of the environment may be more likely to feel that there needs to be more alternatives to give up products and services in favor of environmental protection because of the company's profit goal.

Variables (Table 3 RQ3, A and B) for which no significant statistical differences were observed do not provide convincing grounds for acceptance, but at the same time do not warrant rejection.

**Table 3.**

*Nonparametric test results for research question RQ3 and RQ4*

RQ3: Respondents' willingness to share with others with a view to conserving natural resources			RQ4: Respondents' willingness to give up ownership in favor of access to various goods and services	
A. general acceptance and evaluation of carpooling solutions?				
Items A:	rho-Sperman	Significance (p)*	rho-Sperman	Significance (p)*.
1. Perceive the process of using this form of transportation (carpooling) positively, as not complicated (perceived ease of use)	0.308	0.002**	0.236	0.017*
2. The use of carpooling services is necessary for the protection of natural resources (perceived usefulness)	0.315	0.001**	0.316	0.001**
3. Carpooling saves money (perceived economic value)	0.351	< 0.001**	0.292	0.003**

Cont. table 3.

4. Carpooling is valuable and driven by concern for the environment (perceived intangible value)	0.054	0.593	0.124	0.218
5. Believe it is right to use and recommend this form of car transportation to friends (intention to continue).	0.157	0.117	-0.065	0.518
6. Carpooling will be increasingly used by travelers (perceived development)	0.191	0.055	0.220	0.027*
7. Believe that carpooling service providers will not intentionally harm users (misinformation, lack of fidelity to the idea) thus representing safe travel (trust in the service provider)	0.174	0.81	0.138	0.167
<b>B. general perception of the need to protect natural resources?</b>				
<b>Items B:</b>	<b>rho-Sperman</b>	<b>Significance (p)*</b>	<b>rho-Sperman</b>	<b>Significance (p)*</b>
1. Protecting depleting natural resources should be a priority for me/us, as nature provides us with our basic needs (e.g. water, clean air, land, forests) (sustainable consumption)	0.533	0.001**	0.304	0.002**
2. Reducing environmental pollution (fuel consumption, energy consumption and gas emissions) and leading a non-consumptive lifestyle should be obvious to me/us (sustainable consumption)	0.341	< 0.001*	0.348	<0.001**
3. The actions of companies/brands for the environment can be considered additional to, or are an indirect result of, their activities (sustainable company activities)	-0.272	0.006**	-0.119	0.236
4. There are not enough solutions for the customer (alternatives) to give up products and services, protecting the environment (value alternatives)	0.218	0.029*	0.157	0.117
5. Private ownership will be less attractive to the consumer in the coming years (social attitude)	0.171	0.087	0.266	0.007**
6. In the near future, fewer and fewer people will be able to afford their own car (economic attitude)	0.180	0.071	0.371	<0.001**
7. The transportation industry, including automobiles, is one of the main generators of pollution on earth (ecological/environmental attitude)	0.181	0.070	0.136	0.175

\* $\alpha = 0.05$ ; \*\* $\alpha = 0.01$ .

Spearman's rank correlation coefficient (rho-Spearman) was also used to show significant statistical differences (RQ4) in the relationship between the willingness to give up ownership in favor of access to various goods and services and the overall acceptance and evaluation of carpooling solutions and the need to protect natural resources (Table 3). Spearman's analysis for items in group A (Table 3; RQ4), describing the overall acceptance of carpooling evaluation, showed positive correlations between four variables numbered 1-3 and 6. These include:

1. perceived positive ease of carpooling (rho = 0.236): The correlation value indicates a weak positive relationship ( $0.2 < \rho \leq 0.4$ ). There is a correlation between the willingness to give up ownership of things on property and the perception of the carpooling use process as positive and not complicated.

2. perceived usefulness of carpooling ( $\rho = 0.316$ ): The correlation value indicates a clear but low positive relationship between these variables. Those who are more willing to give up ownership in favor of free access to goods and services are also more appreciative of the necessity of the carpooling initiative from a natural resource conservation perspective.
3. perceived economic value of carpooling ( $\rho = 0.292$ ): The  $\rho$  value indicates a low positive relationship between these variables. Those willing to give up ownership in favor of free access to goods and services also consider carpooling a cost-effective travel method.
4. belief in the growing popularity of carpooling (perceived development) ( $\rho = 0.220$ ): The correlation value indicates a weak positive relationship between these variables. Those willing to give up ownership in favor of using shared goods and services are also more likely to predict an increase in the use of carpooling by travelers in the future.

Next, the rho-Spearman correlation analysis was undertaken for items in group B (Table 3; RQ4), describing the need for natural resource conservation. Positive correlations were identified between four variables numbered 1-2, 5-6 (Table 3. RQ4.B):

1. attachment to conservation of depleting natural resources (sustainable consumption) ( $\rho = 0.304$ ): The correlation value indicates a clear but weak positive relationship between these variables. Those inclined to give up ownership in favor of using shared goods and services also prioritize protecting and depleting natural resources more due to their crucial role in meeting basic needs.
2. reducing environmental pollution and leading a non-consumptive lifestyle should be obvious (sustainable consumption) ( $\rho = 0.348$ ): The correlation value indicates a moderate positive relationship between the propensity to give up ownership of things on property and taking for granted the importance of reducing environmental pollution by reducing fuel consumption, energy consumption and gas emissions, and leading a non-consumptive lifestyle.
3. private ownership will be less attractive to consumers in the coming years due to changing social bases (social attitudes) ( $\rho = 0.266$ ): The correlation value indicates a clear but low positive relationship between the willingness to give up ownership of things on property and the belief that private ownership will be less attractive to consumers in the future due to changing social attitudes.
4. the belief that in the near future, fewer and fewer people will be able to afford to own a car will force people to give up ownership (economic attitude) ( $\rho = 0.371$ ): The value of the correlation score indicates a moderate positive relationship between the variables. Individuals will give up ownership due to a lack of financial capability.

Variables (Table 3, RQ4, A and B) for which no significant statistical differences were observed do not provide convincing grounds for acceptance, but at the same time do not warrant rejection.

## 5. Summary, discussion and limitations

Based on the research conducted to understand the attitude of sharing (transportation, objects) with emphasis on the aspect of conservation of natural resources and the degree of giving up ownership of something, having free access to various goods and services, relative to the characteristics describing the profile of the respondent, it can be concluded that 'gender' and 'age' do not show a significant impact on the issues mentioned above. In contrast, the variable 'residence' indicates significant differences in behavior and perception of the issues studied. Reference can be made here to the study of Aguilera and Pigalle (2021), who pay particular attention to areas of low population density. In these areas, the challenge will be to give up the car or the propensity to share with others. Large urban areas have more transportation solutions. However, public awareness plays a key role in preventing environmental degradation.

The attitudes indicated above in the study were also related to general issues related to the acceptance of carpooling transportation solutions and the need to conserve natural resources. Selected items developed to accept carpooling transportation solutions (so-called ease of use, perceived usefulness, and economic value vs. willingness to act to protect the environment by sharing transportation (items A: 1-3, Table 3) indicate positive relationships between the variables studied. This means those who feel these values are willing to share transportation. A similar relationship was noted in the research works of Venkatesh et al. (2012), Kim et al. (2009), Cheng et al. (2020), Van der Heijden (2004), Sweeney and Sou (2001). In contrast, items 4-7 (i.e., intangible value, intention to continue, perceived development, and trust in the service provider) showed no significant differences between the variables. For these individuals, these values do not significantly impact sharing with others.

In the situation of the perceived need to protect natural resources, the items (so-called sustainable consumption, sustainable corporate actions, alternatives) and the propensity to share transportation (items B: 1-4, Table 3) indicate a positive relationship between the variables studied, i.e., the protection of natural resources is a priority for them, and sustainable consumption is a path that leads society in the right direction. Of course, this requires cooperation at the level of the customer - other entities in the environment, which provide an opportunity to replace non-environmental behavior with environmental ones. However, the other items 5-7 (i.e., social attitude, economic need, and environmental need) did not show significant differences between the variables. Attitude does not always reflect human behavior

but is a good basis for change (Ajzen, 1991). However, the fact that the surveyed items did not show significant differences cannot be unequivocally said to reject them. Each variable covers a complex spectrum of needs, which can be difficult to verify on a small sample of subjects.

On the other hand, the items developed for acceptance of carpooling transportation solutions (i.e., use value, perceived usefulness, economic value, and perceived development vs. willingness to give up ownership of something while having free access to various goods and services (items A: 1-3 and 6, Table 3) indicate positive relationships between the variables studied (Dinesh et al., 2021). The remaining items 4-5 and 7 (i.e., intangible value, intention to continue, trust in the service provider) showed no significant differences between the variables (Arteaga-Sánchez et al., 2020; Correia, Viegas, 2011; Wu, Kim, 2019).

In the situation of feeling the need to conserve natural resources, the items (i.e., sustainable consumption, social and economic attitude) versus the willingness to give up ownership of something while having free access to various goods and services (items B: 1-2, 5-6, Table 3) indicate positive relationships between the variables studied (Falcone, Imbert, 2017). However, items 3-4 and 7 (i.e., sustainable company operations, alternative solutions, and environmental attitude) did not show significant differences between the variables (Lubowiecki-Vikuk et al., 2020; Ramirez et al., 2014).

In conclusion, the studies conducted make an important contribution to understanding consumer attitudes in the context of carpooling and environmental concerns. They point to the need for further research, particularly in how places of residence affect these issues, and underscore the importance of activities that promote a conscious and environmentally friendly approach to resource use.

Limitations of this paper are that the study is declarative in nature, focusing on two attitudes (sharing and opting out) that influence consumer behavior in terms of acceptance of shared transportation and the need to conserve the environment's natural resources. It is therefore necessary to check the actual behavior of carpooling users. It is also necessary to continue studying the reasons that support the legitimacy of carpooling and the special need to care for the environment. Among other things, it may be important to analyze the impact of regulations on the development and spread of carpooling. The article contributes to protecting natural resources through frugal/healthy living and conscious and efficient use of things. In addition, it helps raise awareness of the impact of decisions on the business, government, and social levels.



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