



THE IMPACT OF AIR QUALITY ON THE TOURISM INDUSTRY: MEASURING STAKEHOLDER SUBJECTIVITY IN MURES COUNTRY USING THE Q METHODOLOGY

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Rezumat: Acest studiu analizează percepțiile grupurilor de interes cu privire la calitatea aerului și modul în care acestea influențează industria turismului, urmărind, printre altele, relația dintre calitatea aerului și deciziile de călătorie, impactul poluării aerului asupra cererii turistice și dezvoltarea turismului rural durabil, precum și gradul de conștientizare a calității aerului în țările de origine ale turiștilor. Cu ajutorul analizei factoriale de tip Q (metodologia Q), bazate pe conceptul teoretic de subiectivitate operantă a lui Stephenson, s-au măsurat percepțiile și opiniile subiective a "stakeholderilor" din județul Mureș referitoare la impactul calității aerului asupra industriei turismului. Prin colectarea datelor cu ajutorul instrumentului de tip Q-sort, de la eșantion de 20 de participanți (P-sample) eterogeni din punct de vedere socio-demografic, am evidențiat, prin această cercetare, o preocupare semnificativă cu privire la poluarea aerului și impactul său asupra turismului și mediului din județul Mureș și în special din Târgu Mureș. Rezultatele cercetării relevă o dezaprobare puternică a "stakeholderilor" din P-sample sugerând astfel o înțelegere comună, omogenă a importanței protecției mediului și a necesității unei abordări durabile în industria turismului și nu numai. Au fost identificați trei factori relevanți, inclusiv percepții defavorabile privind: (1) impactul poluării, (2) consensul asupra importanței protejării mediului în turismul sustenabil și (3) diversitatea de percepții cu privire la impactul poluării asupra cererii turistice și satisfacției turiștilor. rezultatele prezentei cercetări subliniază necesitatea unei abordări echilibrate și adevrate pentru a promova un turism durabil și responsabil, luând în considerare similitățile și diferențele de percepții referitoare la impactul poluării asupra cererii turistice.

Cuvinte cheie: Metodologia Q, Impact, Calitatea Aerului, Turism, Poluarea Aerului, Dezvoltare Durabilă, Turism Rural

Abstract: This study examines the perceptions of stakeholders regarding air quality and how it influences the tourism industry, exploring the relationship between air quality and travel decisions, the impact of air pollution on tourism demand, sustainable rural tourism development, and the level of air quality awareness in tourists' home countries. Utilizing the Q Methodology, based on Stephenson's theoretical concept of operative subjectivity, subjective perceptions and opinions of stakeholders in Mureș County regarding the impact of air quality on the tourism industry were measured. Data were collected through the Q-sort tool from a heterogeneous sample of 20 participants (P-sample) socio-demographically. The research highlights significant concern about air pollution and its impact on tourism and the environment, particularly in Târgu Mureș. The results reveal strong disapproval among the stakeholders, suggesting a common, homogeneous understanding of the importance of environmental protection and the need for a sustainable approach in the tourism industry and beyond. Three relevant factors were identified, including unfavorable perceptions regarding (1) the impact of pollution, (2) consensus on the importance of environmental conservation in sustainable tourism, and (3) diversity of perceptions regarding the impact of pollution on tourism demand and tourist satisfaction. The findings underscore the necessity of a balanced and genuine approach to promote sustainable and responsible tourism, considering similarities and differences in perceptions regarding the impact of pollution on tourism demand.

Keywords: Q Methodology, Impact, Air Quality, Tourism, Air Pollution, Sustainable Development, Rural Tourism

JEL Classification: Z32

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1. INTRODUCTION

Lately, society has been facing serious social and environmental issues, posing a significant challenge to the economy both at the national and global levels. Prioritizing environmental protection has become essential for gaining sustainable competitive advantages and is an integral component of proactive industry management in any country (Bacoș & Gabor, 2021). In the specialized literature, tourism is widely recognized as an industry with a major financial and social impact, particularly beneficial in rural areas, significantly contributing to the revitalization and expansion of local economies (Bacoș & Gabor, 2022).

Examining how stakeholder groups perceive different aspects is a crucial pillar in analyzing and understanding interactions across various spheres of activity (Jacobsen, 2020). Researchers have developed innovative approaches to gain a comprehensive and relevant perspective on how individuals or interest groups interpret different elements (Iliescu, 2005). A particularly useful tool in this direction is the Q methodology, also known as Q-factor analysis, which focuses on individuals' subjective perceptions and evaluates them with notable precision (Gabor, 2013) based on Stephenson's operative subjectivity theory.

Despite the widespread COVID-19 pandemic, tourism remains one of the most vital sectors of the global economy, contributing 10.4% to the world's Gross Domestic Product (GDP) but also having a significant impact on CO₂ emissions (Campos, 2021). In the decades preceding the COVID-19 pandemic, the international tourism industry and related services, such as accommodation, public transportation, food and beverages, as well as waste management, experienced considerable expansion. This growth in international tourism brought benefits but also generated negative impacts on local infrastructure, leading to issues related to noise, pollution, and CO₂ emissions, particularly. These unintended consequences have been documented and have drawn national attention to the need to address sustainability in the tourism industry (Gabor et al., 2023).

The rationale behind choosing Q-factor analysis in this applied study lies in investigating the perceptions of interest groups, focusing on identifying and understanding the factors that shape how individuals perceive and interpret events or situations relevant to their areas of interest (McLeon, Hurd, Jensen, 2005). This methodology, both qualitative and quantitative, provides a way to reveal substantive subjective structures that can have a crucial impact on decision-making processes and the development of optimal strategies (Klooster, Visser, de Jong, 2008).

The purpose of this research is to investigate the Q methodology's ability to provide a fresh perspective on interest groups' subjective perceptions compared to traditional methods by highlighting the advantages this method brings to evaluating subjective perceptions and identifying key factors that shape the attitudes and opinions of interest groups regarding the bidirectional relationship between air quality and its impact on public health and the tourism industry's development. The objectives of this research include: (1) designing Q-sort statements using results from foreign literature research; (2) creating the P-sample of subjects belonging to interest groups in Mureș County to ensure opinion heterogeneity; (3) collecting data using the Q-sort questionnaire on interest groups' opinions about air quality and identifying factors influencing these opinions; (4) applying the Q methodology to collected data using the PQ Method and other statistical data processing methods to identify similarities and differences among study participants and identify statements based on which consensus or disagreement was



reached on the research topic; (5) evaluating the relationship between individual perceptions of air quality and respondents' travel decisions, both nationally and internationally, as well as analyzing the impact of air pollution in tourist areas on tourism demand, including from local and international tourists.

By deepening the understanding of how interest groups perceive different aspects of their domain, this study aims to contribute significantly to improving communication, decision-making processes, and a deeper understanding of the needs and desires of these involved actors (Song & Ko, 2017). The results obtained through Q-factor analysis can open new horizons in researching interest group perceptions and contribute to formulating personalized strategies and solutions tailored to their requirements and expectations (Gabor, 2008).

Q methodology is a relatively recent tool in this field but has been widely recognized for its profound applications in areas where the psychometric understanding of individuals has significant implications. The results provided by this methodology are considered superior to other much-known and easier-to-use methods (Gabor & Cristache, 2021).

Introduced by William Stephenson 80 years ago, Q methodology promotes the idea that people do not act in social life objectively but, depending on how they subjectively perceive that objectivity, i.e., based on their own subjectivity (Iliescu, 2005, pp.10-13). Q methodology utilizes factorial analysis as a method of quantitatively analyzing subjective data. In the context of marketing research, preferences, opinions, and attitudes of consumers are subjective, making the Q-sort tool reveal subjective structures or subjectivity itself. The key concept proposed by Stephenson refers to operative subjectivism, and the purpose of Q-factor analysis is to identify factors based on which individuals/subjects can be grouped according to their similarities rather than variables (Gabor & Cristache, 2021). It also provides a solid foundation for the systematic study of subjectivity, making it essential for researchers interested in the qualitative aspects of human behavior.

One major difference between Q methodology and R-type factor analysis, in practice, is that Q methodology is based on a representative sample of opinions, not consumers or subjects. The fundamental principle of this methodology involves presenting a set of statements related to a specific subject, and subjects are asked to rank them on a 9-point Likert scale from "agree" to "disagree" (Sy et al., 2018). This procedure is known as Q-sort, where the statements express opinions, not facts. Subjects arrange these opinions based on their preferences, thus revealing subjectivism and the significance attributed to them. Various methods can be applied to generate statements used in Q methodology, such as structured interviews, in-depth interviews, previous survey-based research, recordings of interviews with subjects, or statements taken from other sources, such as literature, existing scales, or standardized items (Van Ejck et al., 2017).

Q-factor analysis is a complex research technique used in the field of air quality and its influence on the tourism industry and human health (Babcock–Lumish, 2005). This method combines both quantitative aspects (using factorial analysis as a computational technique) and qualitative aspects, requiring a descriptive interpretation of each identified factor (Lufele, 2006).

Q methodology has an evidently synthetic approach, focusing on how interest groups are contacted and evaluated regarding the structures they belong to, instead of dividing the entire phenomenon into distinct elements (Babcock-Lumish, 2005). This method emphasizes identifying and understanding variation factors, proving effective in researching and segmenting tourists in the tourism industry. Therefore, Q methodology proves to be both an intra-personal

and inter-personal method, strengthening the connections between consumer group opinions, attitudes, and preferences (Babcock-Lumish, 2005).

In contrast, the rationale of R-type factor analysis, opposed as a methodological principle to Q methodology, lies in describing the entire phenomenon by reducing it to its constitutive parts (McLeon, et al. 2005). This approach focuses on identifying intrinsic factors and, in studies related to the impact of air quality, could be used to analyze the chemical or physical components influencing this aspect (Krabbenborg et al., 2020). However, in researching the effects of air quality on the tourism industry and human health, Q methodology proves to be more suitable, considering the research's specificities and the need to better understand the subjective perception of air quality's impact on different interest groups (Gabor & Cristache, 2021).

Q methodology relies on correlations between subjects rather than variables and is particularly important in modeling, segmenting, or connecting tourists and consumers to the market. It has been successfully used to develop opinions, personality structures, and mental attitude models regarding specific products and issues in the tourism and health industry (Klooster, Visser, de Jong, 2008). Therefore, Q methodology proves to be a valuable tool in investigating the influence of air quality on tourist behavior and people's health, providing a comprehensive perspective and deepening the understanding of the phenomenon in the given context (Kufeld, 2006, p. 19).

2. METODOLOGY

This research was conducted to analyze the public's perceptions of air quality and its impact on the tourism industry using the Q methodology. The sample included 20 participants aged 18 to 60, randomly selected from diverse backgrounds, both urban and rural, and with various occupations from different sectors.

In the present study, the statements used in the Q-sort were developed based on the findings from research published in international scientific literature. In total, 25 statements were created and used in the research, comprising the Q-sort employed in the study. These statements are presented in detail in Table No. 1, with the authors who published the scientific results indicated in the last column.

Table No. 1 - Statements Used in Q-sort Data Collection

No.	Statements	Authors
1	Wind speed can be perceived as a fundamental variable in the impact of air pollution in urban tourist areas.	Zhang et al., 2015
2	Air pollution has a negative influence on domestic tourist flows. Areas with low pollution indirectly favor domestic tourism.	Zhu et al., 2018
3	Sustainable and economic development of rural tourist areas (with a focus on agro-tourism, green tourism, eco-tourism, and bio-tourism) can have short-term positive effects on overall air pollution, as demonstrated in the Asian region.	Wang, L., et al., 2018
4	Tourist demand is strongly influenced in certain areas with high pollution. The most influential parties are national authorities (governments), local authorities (councils and mayors), private companies in the tourism industry (travel agencies, tourism service providers) who can influence both domestic and	Zhang & Lu, 2022



	international tourist demand through measures aligned with the pollution level of the respective area/country.	
5	One of the most significant factors in tourist satisfaction is low air pollution. Tourists are more willing to pay more for an area with low air pollution for higher satisfaction.	Li et al., 2011
6	An increase in the tourist flow can deteriorate air quality, according to a study conducted in five European countries. Poorer air quality decreases tourist demand.	Robaina et al., 2020
7	Although tourist demand is significantly affected by air quality, the tourism supply is one of the main contributors to overall air pollution (cruise ships, airlines, food services). The mismatch between these two components in the tourism market creates economic and social instability.	Xu et al., 2019
8	Domestic tourists tend to choose tourist destinations with an inversely proportional ratio of air quality between their residence and the tourist destination.	Wasem, 2005
9	Tourism depends heavily on weather conditions and climate, so consumer preferences are significantly influenced by climate-related attributes.	Wang et al., 2018
10	Even though air quality is not a primary factor in travel planning, air pollution episodes (fog, unpleasant odors, etc.) during a trip significantly impact tourist behavior.	Rodrigues et al., 2021
11	Measures taken by authorities to restrict travel during the Covid-19 pandemic had beneficial effects on promoting domestic tourism, online/virtual tourism activities, and the use of environmental aspects such as air quality to create attractiveness and competitiveness in the tourist destination market.	Nagy et al., 2022, Nagy et al., 2023
12	Industrial development in rural areas indirectly leads to a medium to long-term decrease in the number of tourists in those areas.	Chen et al., 2008
13	A decrease in air pollution would not significantly increase domestic tourist flows in the short to medium term.	Dong et al., 2019
14	The impact of pollution in tourist source countries can be explained by a greater awareness and concern about air pollution among potential tourists if they reside in more polluted countries.	Xu și Dong, 2020
15	Tourist transportation is one of the main causes of climate change.	Peeters, et al., , 2007
18	The concept of air quality has become particularly known in the tourism sector in recent times.	Carneiro et al., 2021
19	Mountain air is an important advantage in tourism competitiveness on one hand and maintaining physical and mental health of the stakeholders in this industry, the tourists.	Wasem et al., 2005, Bacoș & Gabor, 2021
20	International tourists have a negative impact on emissions, while domestic tourists have a positive impact.	Ciarlantini et al., 2022
21	Environmental protection and the importance of ecological development awareness are key aspects in sustaining and promoting tourism.	Gabor M.R et al., 2023
22	Tourists play a significant role in promoting sustainable tourism development.	Peng et al., 2020
23	In conditions of stress and urban life, rural tourism contributes to improving the quality of life.	Bozhinova & Georgieva, 2023

24	The most dangerous pollutants (PM2.5 and PM10) are not as well known compared to CO and NO2.	Zhang et al., 2015
25	Tourist activities are directly linked to environmental degradation, with severe consequences and enormous effects on biodiversity.	Ștefănică et al., 2021

Source: Created by the author

Table No. 2 presents the socio-demographic characteristics of the study participants (P-sample).

Table No. 2 Structure of the P-sample (n=20)

<i>Characteristics</i>		Absolute Frequencies	Relatives Frecquecies
Gender	Male	10	50%
	Female	10	50%
Background Environment	Urban	10	50%
	Rural	10	50%
Age	<24 years	6	30%
	25-34	5	25%
	36-49	7	35%
	>50 years	2	10%
Marital Status	Married	10	50%
	Single	9	45%
	Widowed	1	5%
Occupation	Self-employed	4	20%
	Employee with higher education	9	45%
	Student	4	20%
	Entrepreneur	3	15%
Field of Activity	Education	5	25%
	Business/Tourism Management	5	25%
	Medicine	2	10%
	Automotive	2	10%
	Law	2	10%
	Art	2	10%
	Engineering	2	10%
Education Level	Bachelor's degree	10	50%
	Master's/Ph.D.	8	40%
	High school/vocational school	2	10%



Monthly Income	5001-7000 lei	5	25%
	>7000 lei	4	20%
	2001-3000 lei	3	15%
	3001-5000 lei	6	30%
	<2000 lei	1	5%
	No income	1	5%

Source: conducted by the author

Schematically, a Q-methodology used in a study conducted by the authors consists of 30 items (statements) and can be represented as shown in Figure 1, with a normal distribution of the number of statements in each "pile": 1 2 3 4 5 4 3 2 1.

Figure No. 1 - Example of an Incomplete Q-Sort

DISAGREE				NEUTRAL	AGREE			
- 4	- 3	- 2	- 1	0	+ 1	+ 2	+ 3	+ 4
1								1
	2						2	
		3				3		
			4		4			
				5				

Source: (Adapted from Kramer, B., Hegedus, P., Gravina, V. - Evaluating a Dairy Herd Improvement Project in Uruguay to Test and Explain Q Methodology, Proceedings of the 19th Annual Conference Raleigh, Carolina, 2003, p. 347)

In Figure No. 2, you can observe an example of a Q-sort performed by a participant, generated using the Pq Method software, one of the free programs available for the analysis of data collected through Q-factorial analysis.

Figure no. 2 - Examples of Q Method Factorial Analyses Completed and Generated with the Help of PQMethod Software

DISAGREE				NEUTRAL	AGREE			
- 4	- 3	- 2	- 1	0	+ 1	+ 2	+ 3	+ 4
5	25	18	10	14	15	21	23	3
1	9	20	13	1	8	2	6	1
	2	11	24	4	19	22	2	
		3	17	16	12	3		
			4	7	4			

Source: Realised by authors

To conduct the analysis, we employed PQ Method software for Q factor analysis, which enabled the investigation and interpretation of participants' subjective data and perceptions. Additionally, we utilized SPSS (Statistical Package for the Social Sciences) software for descriptive statistical analysis and correlations. Excel was used for data organization and management, and it contributed to generating graphs and relevant visual presentations for result interpretation. These software tools were indispensable for data processing and obtaining appropriate results in the research.

In developing the research methods for this study, we drew upon existing studies and research in the field of air quality and its impact on the tourism industry. These reference sources, as presented in Table No. 3, served as the theoretical foundation for formulating our research hypotheses.

Table No. 3, presenting the research hypotheses and their corresponding conceptual sources, provided a clear framework for the development of these hypotheses. These hypotheses constituted the basis for designing the statistical methodologies applied in this study.

Table No. 3. Research Hypotheses and Applied Statistical Methods

Hypothesis of the research	Conceptual framework	Applied statistical methods
H1 = The perception of air quality influences the travel decisions of individuals.	Zhang, A., Zhong, L., Xu, Y., Wang, H., & Dang, L. (2015) Bacoș & Gabor (2022)	<ul style="list-style-type: none"> • Descriptive
H2 = The level of air pollution in tourist areas affects domestic and international tourism demand.	Zhang & Lu (2022), Dong, D., Xu, X., Yu, H., & Zhao, Y. (2019). Yuan, Nie&Xu (2021)	<ul style="list-style-type: none"> • Simple correlations • Q-type factor analysis
H3 = Sustainable development of rural tourist areas can reduce the impact of air pollution and attract more tourists.	Wang, L., Fang, B., & Law, R. (2018) Chen, J., Tan, M., Li, Y., Zheng, J., Zhang, Y., Shan, Z., Zhang, G., & Li, Y. (2008),	<ul style="list-style-type: none"> • Qualitative data analysis
H4 = Awareness of air quality in the tourists' countries of origin can influence their decision to travel to low-pollution areas.	Xu & Dong (2020) Peeters P., Szimba E., Duijnisveld M (2007) Ștefănică, Sandu, Butnaru, & Haller (2021)	

Source: Created by the author

3. RESULTS

Following the processing of Q-sorts collected from the 20 participants representing stakeholder groups, three significant factors describing participants' perceptions of the interaction between air pollution and tourism were identified. Each factor is represented by a distinct set of statements, and the Z score indicates the degree of consensus or disagreement among the participants as follows:

(1) Factor 1: Unfavorable perceptions of the impact of pollution on tourism and the environment is characterized by strong disapproval among participants regarding the negative impact of pollution on tourism and the environment. Statements in this factor refer to the direct



connection between tourism activities and environmental degradation, highlighting severe and extensive effects on biodiversity. Participants expressed concerns about the negative impact of industrialization in both rural and urban areas, emphasizing the negative impact on the number of tourists. It also addresses how pollution affects tourist preferences and the potential tourist demand. Positive Z scores for the statements in this factor indicate widespread disapproval among participants regarding these issues.

(2) Factor 2: Consensus on the importance of environmental protection in sustainable tourism reflects strong agreement among participants regarding the importance of protecting the natural environment in the development of sustainable tourism. Participants believe that clean air and an ecological environment are essential factors in attracting tourists. Statements in this factor emphasize that measures taken during the COVID-19 pandemic, such as travel restrictions and the promotion of online tourism, had a beneficial impact on domestic tourist demand. Positive Z scores indicate a generalized agreement among participants on these issues.

(3) Factor 3: Diverse perceptions of the impact of pollution on tourist demand and satisfaction is characterized by moderate discrepancies in the perceptions of participants regarding statements related to the level of tourist satisfaction and the impact of pollution on tourist demand. Statements in this factor refer to the importance of low pollution levels in tourist satisfaction and the influence of weather and climate conditions on tourist preferences. Variable Z scores for the statements in this factor reflect non-consensual opinions among participants. Figures 3-5 present the Z scores obtained for each of the three factors resulting from the analysis using PQ Method software in our study, concerning the perceptions of the subjects regarding the interaction between air pollution and tourism.

In Figure No. 3, Z scores for Factor 1, "Unfavorable Perceptions of the Impact of Pollution on Tourism and the Environment," are observed. Statements highlighting strong disapproval among participants regarding the negative impact of pollution on tourism and the environment have positive Z scores, indicating a high level of consensus among participants. These statements underscore the importance of environmental protection and concern for the negative effects of industrialization and pollution on tourist areas. On the other hand, statements with negative Z scores represent aspects that may provoke debate or be perceived in a more neutral manner.

Figure No. 3 Z Scores for Each Statement Comprising Factor 1

Agree		Neutral		Disagree	
Statement	Z Score $Z > 1$	Statement	Z Score $0 < Z < 1$	Statement	Z Score $Z < 0$
7	1,93	10	0,99	18	-0,07
12	1,76	23	0,8	11	-0,08
6	1,14	9	0,78	22	-0,11
		21	0,66	1	-0,19
		13	0,56	3	-0,25
		4	0,5	5	-0,35

2	0,34	8	-0,39
20	0,2	24	-0,42
		25	-0,53
		14	-0,8
		16	-1,03
		17	-1,74
		19	-1,81

Source: created by the authors based on information provided by the Q Method software

In addition to participants' perceptions, the study also examined the correlations between their demographic characteristics and their perceptions of air quality and tourism. The results indicated that certain characteristics, such as age, gender, occupation, and education level, can influence perceptions on these matters. For example, participants in the medical field showed positive correlations among themselves, suggesting a higher awareness of the impact of pollution on health and the environment. Similarly, participants aged 25 to 34 and those working in the field of engineering displayed positive correlations, indicating a common perspective on tourism and environmental responsibility.

In Figure No. 4, Z scores for Factor 2, "Consensus on the Importance of Environmental Protection in Sustainable Tourism," are presented. The results show a strong agreement among participants regarding the importance of environmental protection in the development of sustainable tourism. This shared perspective indicates that clean air and an ecological environment are essential factors in attracting tourists. Measures taken during the COVID-19 pandemic, such as travel restrictions and the promotion of online tourism, were viewed positively and had a beneficial impact on domestic tourist demand. These findings suggest a collective desire to adopt a more environmentally friendly and responsible approach within the tourism industry.

Analyzing the Z scores, we observe that statements with Z scores >1 reflect a strong consensus regarding the importance of environmental protection measures for sustainable tourism development. These measures may include travel restrictions, the promotion of virtual and online tourism, or innovative solutions to reduce the negative impact on the environment. Statements with Z scores between 0 and 1 represent moderate consensus among participants about the importance of environmental protection.

Negative Z scores indicate disagreement regarding the importance of certain aspects related to environmental protection in tourism.

Figure No. 4 Z Scores for Statements Comprising Factor 2

Agree		Neutral		Disagree	
Statement	Z Score $Z > 1$	Statement	Z Score $0 < Z < 1$	Statement	Z Score $Z < 0$
4	2,19	18	0,97	22	-0,14
3	1,82	5	0,92	14	-0,15
2	1,37	7	0,86	12	-0,31



21	0,51	11	-0,31
6	0,46	15	-0,4
25	0,31	24	-0,46
1	0,25	10	-0,51
17	0,25	20	-0,51
		8	-0,71
		13	-0,72
		16	-0,86
		23	-1,31
		9	-1,64
		19	-1,88

Source: created by the author based on information provided by the Q Method software

In Figure No. 5, Z scores for Factor 3, "Diversity of Perceptions Regarding the Impact of Pollution on Tourist Demand and Satisfaction," are presented. This factor highlights aspects that have generated divided opinions among participants regarding the interaction between the level of tourist satisfaction and the impact of pollution on tourist demand. The Z scores indicate the existence of a diversity of perceptions regarding the relationship between air pollution and tourists' preferences or satisfaction. Statements with Z scores >1 indicate significant agreement among participants regarding the importance of low pollution levels in tourist satisfaction.

These statements suggest that many participants consider air quality to play a crucial role in determining their satisfaction during travel. Additionally, positive Z scores indicate a consensus among participants regarding the influence of weather and climate conditions on tourists' preferences. On the other hand, statements with Z scores between 0 and 1 represent a number of participants expressing a neutral viewpoint or partial agreement regarding certain aspects related to the impact of pollution on tourist demand.

Negative Z scores ($Z < 0$) reflect non-consensus regarding the impact of pollution on tourist demand.

Figure No. 5 Z Scores for Statements Comprising Factor 3

Agree		Neutral		Disagree	
Statement	Z Score $Z > 1$	Statement	Z Score $0 < Z < 1$	Statement	Z Score $Z < 0$
5	1,61	4	0,87	6	-0,07
9	1,55	20	0,74	17	-0,07
25	1,41	12	0,13	24	-0,13
21	1,33	8	0,13	18	-0,2
10	1,21			2	-0,27
11	1,08			13	-0,33

23	-0,34
22	-0,54
1	-0,67
16	-0,73
14	-0,8
15	-1,27
7	-1,34
19	-1,34
3	-1,95

Source: created by the author based on information provided by the Q Method software

In Table No. 6, the Z scores indicate the degree of consensus or disagreement among the participants regarding each statement in the Q-sort. The table identifies statements on which participants had more convergent opinions (16, 24, 19, 14, 8) and those for which there is disagreement and diversity of opinions (23, 17, 12, 9, 3).

Table No. 6 Z Scores and Individual Values for Statements in Q-Sort by Degree of Consensus and Disagreement

Statement Number	Factor 1	Factor 2	Factor 3	Z Score
16	-2	-2	-2	0,015
24	-1	-1	0	0,021
22	0	0	-1	0,038
19	-3	-4	-3	0,057
14	-2	0	-2	0,094
8	-1	-2	1	0,12
21	1	1	2	0,128
1	0	1	-1	0,142
6	3	1	0	0,246
20	0	-1	1	0,261
18	0	2	0	0,272
13	1	-2	-1	0,287
11	0	0	2	0,367
15	-4	-1	-2	0,382
2	1	3	0	0,457
4	1	4	1	0,527
10	2	-1	2	0,581
25	-2	1	3	0,634



5	-1	2	4	0,662
23	2	-3	-1	0,747
17	-3	0	0	0,765
12	3	0	1	0,787
9	2	-3	3	1,849
7	4	2	-3	1,854
3	-1	3	-4	2,374

Source: Compiled by the author based on information provided by the Q Method software.

To analyze whether there are correlations between respondents' answers based on the 25 statements in the Q-sort regarding air quality and the tourism industry, we extracted the correlation matrix from the PQ Method results, which is presented in Figure 4.

Positive correlations indicate similar responses to statements and, therefore, similar perceptions regarding air quality and its impact on the tourism industry (marked in blue in Figure 6). The closer the correlation value is to 100, the stronger the correlation, indicating greater similarity between subjects.

Negative values indicate respondents who provided different responses to the statements about air quality had divergent perceptions regarding the tourism industry. The closer the correlation value is to -100, the stronger the inverse association between these aspects. These correlations can be visualized as a heat map in Figure No. 6.

Figure No. 6 Heat Map for the Association Between Subjects

Respondent	1	2	3	4	5	6	7	8	9	10
1		-2	3	48	-26	-9	-16	-14	28	27
2	-2		-13	3	-5	5	-13	14	2	-18
3	3	-13		11	14	9	8	0	32	33
4	48	3	11		-9	8	-27	2	23	48
5	-26	-5	14	-9		18	-8	-15	-28	9
6	-9	5	9	8	18		-6	26	2	0
7	-16	-13	8	-27	-8	-6		24	9	-15
8	-14	14	0	2	-15	26	24		-11	3
9	28	2	32	23	-28	2	9	-11		10
10	27	-18	33	48	9	0	-15	3	10	
11	-11	-33	37	22	9	20	17	-6	30	6
12	38	-25	-8	44	-37	25	-22	5	25	38
13	14	-41	2	3	-33	-4	17	-5	24	13
14	-31	25	-8	-12	40	-6	1	4	-31	9
15	-1	-18	-7	12	8	2	16	-45	15	41

16	5	-11	-9	3	-1	-6	-7	4	14	32
17	-16	41	-29	7	23	-15	-26	-12	-16	10
18	21	-30	23	30	10	63	-16	0	36	5
19	-33	42	-26	-22	-19	-6	-3	20	-41	-16
20	65	-9	45	70	13	1	-13	-13	22	50

Source: Compiled by the author based on information provided by the Q Method software.

Analyzing the positive correlations between subjects, we can identify some relevant demographic similarities, as follows:

- Subject No. 20 and Subject No. 1 are males, come from urban backgrounds, aged 25 to 34, work in the Education sector, have bachelor's degrees, and earn monthly incomes between 5001 and 7000 lei;
- Subject No. 1 and Subject No. 4 are males, aged 25 to 34, with backgrounds in Business Administration in Commerce, Tourism, and Services, and Medicine, with bachelor's degrees;
- Subject No. 4 and Subject No. 12 are males, aged 24 to 34, working in the fields of Medicine and Business Administration, Commerce, Tourism, and Services, with master's and/or doctoral degrees;
- Subject No. 11 and Subject No. 12 are males, aged 25 to 34, in the fields of Engineering and Medicine, both with master's/doctoral degrees;
- Subject No. 13 and Subject No. 12 are males, aged 25 to 34, in the medical field, with master's/doctoral degrees;
- Subject No. 1 and Subject No. 11 are males, aged 25 to 34, working in the field of Engineering, with bachelor's degrees;
- Subject No. 10 and Subject No. 15 are females, aged 36 to 49, in the field of Business Administration, Commerce, Tourism, and Services, with master's/doctoral degrees;
- Subject No. 15 and Subject No. 16 are females, aged 36 to 49, in the Arts field, with bachelor's degrees.

In our data analysis, we also found significant negative correlations between subjects with different ages and areas of activity, with a particular focus on occupation and education level. For instance, Subject No. 1 and Subject No. 14, two males with bachelor's degrees, exhibited a negative correlation of -31, while Subject No. 7 and Subject No. 8, two females with master's/doctoral degrees, showed a negative correlation of -45.

4. CONCLUSIONS

The results of this research provide valuable insights into the subjective perceptions of interest groups in Târgu Mureș regarding the impact and connection between air pollution and the tourism industry. Firstly, it is noted that the participants have a significant concern about the negative impact of pollution on tourism, especially on the environment in general. This strong disapproval suggests a unanimous perception among the interest groups included in the research regarding the importance of environmental protection and the need for a more responsible and sustainable approach within the tourism industry.



The results of this research also reveal that participants express significant concerns about the negative impact of pollution on the tourism industry and the environment, thus indicating a subjective perception of the importance of protecting the environment and the necessity for a more responsible and adaptable approach to the current international conditions. Furthermore, it was found that there is a strong consensus on the importance of environmental protection in sustainable tourism, especially in the context of measures taken during the COVID-19 pandemic (such as travel restrictions and online tourism promotion), which were perceived as having a beneficial impact on domestic tourism demand, emphasizing the importance of a more responsible and adaptable approach.

However, the research results also highlighted differing opinions regarding the impact of pollution on tourism demand and tourist satisfaction, indicating a diversity of subjective perceptions that not all participants share the same understanding of the influence of air quality on the tourist experience. This lack of consensus can be associated with individual factors, such as personal preferences, past experiences, and awareness of the environmental impact on travel and the impact of travelers on the environment.

By applying Q-factor analysis, three relevant factors were identified: (1) "unfavorable perceptions of the impact of pollution on tourism and the environment," (2) "consensus on the importance of environmental protection in sustainable tourism," and (3) "diversity of perceptions regarding the impact of pollution on tourism demand and tourist satisfaction." These factors underscore significant concerns related to environmental degradation, the importance of environmental protection in the development of sustainable tourism, and the diversity of opinions about the impact of pollution on tourism demand and tourist satisfaction.

Regarding the clusters formed based on demographic similarities among participants, it was observed that certain characteristics (age, gender, field of activity, and educational level) influence and determine perceptions concerning the relationship between air quality and the tourism industry.

In conclusion, the results of the study highlight the significant issue of air pollution concerning tourism development. To protect the environment and support the sustainable growth of the tourism industry, it is necessary to focus on ecological policies and practices, ensuring that tourism continues to bring benefits to both local communities and tourists without negatively affecting the quality of the environment.

One of the major limitations of this research is related to the sample size and diversity used in the study. However, according to the applied methodology and recommendations, the P-sample should not exceed 30 subjects, and an optimal sample size is recommended to be between 20-25 subjects.

In summary, the study emphasizes that air pollution is a significant concern in relation to tourism development. To protect the environment and sustain the growth of the tourism industry, it is crucial to focus on ecological policies and practices, ensuring that tourism continues to provide benefits to local communities and tourists without negatively impacting the environment.

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