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Users' Perceptions and Emotions Regarding Seaplane Services in Greece: An Analytical Perspective

IOANNIS SITZIMIS, IRINI DIMOU, MARKOS KOURGIANTAKIS, ACHILLEAS KANELLIS

Hellenic Mediterranean University, Heraklion, Greece

ABSTRACT: This study aims to investigate the attitudes and sentiments of transportation service users in Greece towards seaplanes and to assess seaplanes' qualitative, economic, and environmental advantages and disadvantages compared to traditional ships and airplanes. The findings of this research are crucial for both businesses and the government. Companies can develop effective marketing strategies to promote seaplanes as a viable transportation option, while the government can make informed decisions based on the findings. By using structured questionnaires and conducting exploratory factor analysis, three key factors were identified, explaining 59.22% of the total variance. These factors relate to the contributions of seaplanes to domestic development, their environmental and economic impact, and the comfort and safety they offer. Subsequently, these factors were utilized for further statistical tests. Regarding the likelihood of choosing seaplanes as a mode of transport, the analysis revealed that men are more inclined to select seaplanes than women and older age groups are more likely to select seaplanes than younger ones. Residents of Crete show more openness towards seaplanes than those in Attica, and a similar trend is observed among individuals who travel frequently for leisure, business, or personal reasons. The analysis also indicates that fear has a more decisive influence than feelings of freedom and joy. Individuals without strong emotional responses tend to have a more positive view of seaplanes than those who experience feelings of freedom or joy. Furthermore, correlation analysis demonstrated a moderate, positive correlation between the perception of comfort and safety provided by seaplanes and individuals' preference for this mode of transport.

KEYWORDS: Seaplanes; Water airports; Exploratory factor analysis; Inferential tests; Correlation analysis

1. INTRODUCTION

Seaplanes have been a significant mode of transportation in Greece since the early 20th century (Kafasis, 2020; Zelef, 2014). Recently, there has been renewed interest in seaplanes, especially in remote island destinations where traditional transportation options are limited (Kalogeri et al., 2019). In 2014, Hellenic Seaplanes became the country's first licensed company to operate seaplanes. Seaplanes have the potential to revolutionize travel in Greece by offering a faster and more efficient mode of transport between the islands and the mainland (Ballis et al., 2018). However, their use is still undeveloped, characterized by the lack of scientific research on the subject. Given Greece's extensive coastline and numerous islands, seaplanes could be a viable and sustainable long-term alternative to current modes of transportation, as is the case in other European countries like Croatia, which share similar geographical characteristics (Favro et al., 2016).

Developing seaplanes in Greece is an innovative solution to the challenges posed by the country's geography (Kafasis, 2020; Kalogeri et al., 2019). Alongside conventional modes of transport such as ferries, air travel, rail, and road transport, seaplanes have the potential to strengthen domestic economic development (Ballis et al., 2018; Andrade et al., 2023; Favro et al., 2016). However, issues still need to be addressed, such as securing the necessary seaplanes' infrastructure, including proper berthing facilities and maintenance services. The limited number of seaplanes available to companies may limit their ability to expand their services to meet growing demand. Bureaucratic delays in preparing definitive state measures and slow procedures for preparing and legalizing water airports act as obstacles. Fortunately, the recent legislation 4663/2020 provided a basis for the development of the seaplane market, including information relevant to the operation of these airports as well as measures such as environmental requirements, flight conditions, and general provisions (Andrade et al., 2023). A few companies are the main prospective operators of such activities and are awaiting government approval to start their business venture (Capital.gr, 2023). According to Hellenic Seaplanes, official flights for travelers are anticipated to commence in September 2024. Preliminary test flights have been successfully executed to the Skopelos, Alonissos, and Skyros islands (Radar.gr, 2024). The flight program included a series of introductory routes designed to facilitate the concept of "island hopping". This initiative offered a valuable opportunity for prospective travelers and local authorities to engage with and evaluate seaplanes' operational benefits and capabilities in a practical context. To date, operations have been limited to test flights across various locations, highlighting the ongoing development of this maritime aviation initiative.

The decision to use a mode of transport is influenced by various factors such as ticket price, ease of accessibility, safety, comfort, time-saving, and environmental impact. According to Yuen and Thai (2015), quality is one of the cornerstones of a service's user happiness. Cole (2005) states that the primary factors influencing the quality of transportation services are the frequency of departures and arrivals, the level of service, comfort, dependability, and safety. Sambrakos (2018) broadly agrees with this viewpoint. Some authors (Grigoroudis & Siskos, 2004; Hensher et al., 2003; Tyrinopoulos & Aifadopoulou, 2008; Sitzimis, 2024a) concentrate on fare level and trip time, among other aspects. These factors are likely to apply to seaplanes and are constantly compared by passengers to ships and airplanes. Issues such as seasonality and the resulting low demand for capacity in off-peak periods (basically during the winter months), unpredictable weather conditions, and problematic infrastructure are com-

mon to both sea and air transport (Iliopoulou et al., 2015; Sitzimis, 2021; Sitzimis, 2022). Sea transport offers cost advantages over air travel, particularly for economy-class tickets. However, it has drawbacks regarding longer travel time and susceptibility to weather conditions. Both helicopters and seaplanes operate without requiring significant infrastructure, with seaplanes being faster, more comfortable, and more maneuverable. However, they are more affected by adverse weather and strong winds (Castelluccio et al., 2016). A recent study by Shabrina et al. (2022) indicated that seaplanes do not possess the capability to operate year-round. Specifically, a 19-seat seaplane can operate approximately for 258 days annually.

Seaplane users typically seek a unique travel experience and are willing to pay a premium (Favro et al., 2016). Market segmentation is crucial for seaplane operators, as different customer segments have varying needs and preferences (Rigas, 2009). Factors such as demographics, income level, and travel habits can influence customer behavior and willingness to use this mode of transportation. Some users may find it unique (in terms of experience) for inter-island travel, while others may be skeptical about the safety or environmental impact. Potential target groups may include tourists looking for a unique and convenient way to travel between islands, business travelers who need to reach remote locations quickly, and locals who live on islands and need to travel to the mainland for other reasons (Ballis et al., 2018). Additionally, rescue services and emergency medical care availability is noteworthy (Favro et al., 2016). Understanding the needs and preferences of these different target markets can help seaplane operators customize their services and marketing efforts to meet customer needs better (Rigas, 2009).

This study aims to analyze the attitudes and feelings of transportation service users regarding seaplanes in Greece. It also intends to identify seaplanes' qualitative, economic, and environmental advantages or disadvantages compared to ships and airplanes.

The research questions we attempt to answer are the following:

- Are there differences in how respondents perceive the contribution of water airports to domestic development, the comfort and safety provided by seaplanes, and the environmental and economic impact of seaplanes compared to ships and airplanes based on factors such as gender, age, marital status, educational level, occupation, and region of residence?
- Does respondents' current travel frequency, reason for travel, and chosen mode of transportation influence their opinions on the contribution of water airports to domestic development, the comfort and safety provided by seaplanes, and the environmental and economic footprint of seaplanes compared to ships and planes?
- Are there differences in respondents' feelings about seaplanes due to gender, age, marital status, educational level, occupation, and region of residence?

The exploration of user perceptions and experiences within the transportation industry has been thoroughly examined in numerous research studies (Ekinci et al., 2015; Imam, 2014; Eshaghi et al., 2024; Alaydaa et al., 2023; Sitzimis, 2024a; Sitzimis, 2024b). However, there is a noticeable gap in literature when it comes to seaplanes specifically. Limited attention has been given to understanding user experiences with seaplanes, with very few studies exploring this area (Andrade et al., 2023; Castelluccio et al., 2016; Favro et al., 2016; Mohr & Schonmann, 2011; Lou et al., 2019; Zelef, 2014) and almost none utilizing exploratory factor analysis (EFA) as a means of research methodology. EFA is a commonly employed statistical technique in traffic and transportation research, often applied for developing and validating measurement tools (Ledesma et al., 2021). For instance, many researchers working within the maritime industry have utilized EFA (Maskey & Nguyen, 2018; Sitzimis, 2024b). This method is particularly valuable in maritime research, where numerous variables cannot be directly measured and must be assessed through indirect indicators. Indeed, exploratory and confirmatory factor analysis (CFA) were utilized to identify key determinants affecting passenger traffic levels at domestic airports in Nigeria (Adenigbo et al., 2022), while EFA was also utilized to investigate the factors and operational mechanisms that impact the overall comfort experienced by passengers of high-speed railways (Fan et al., 2022). As a result, this study represents a unique contribution to the field, given the absence of comparable research on seaplanes.

The research is important for both companies and the governmental authorities. Companies operating seaplanes and water airports can use this information to develop marketing strategies that emphasize the benefits of seaplanes and position them as a viable alternative or complementary option to other modes of transportation (Siskos et al., 2025). Understanding the preferences of the local population is crucial for companies to tailor their services to the needs and expectations of their target market (Rigas, 2009). The government, on the other hand, can make future decisions based on understanding how people perceive seaplanes. This could involve simplifying bureaucratic processes, providing business facilities, and financing water airport infrastructure. For instance, El Hafizah et al. (2023) found that better infrastructure attracts more tourists. More tourists can boost the local economy, but proper policies are necessary to sustain tourism. Additionally, the government may need to offer subsidies, known as public service obligations, to ensure that transport services are available even when they are not profitable due to low demand (barren lines). European nations have the freedom to determine the routes and rates they want to operate, but the general legal framework of the European Commission binds them. According to Braathen (2011) and Fageda et al. (2018), another option would be to delegate this role to seaplanes, as they offer greater flexibility and lower operating costs compared to airplanes.

The subsequent section examines the principal findings of prior research that delineate the attitudes and inclinations of seaplane users or potential users. Section 4 outlines the methodology employed in the present study, along with the primary results. Specifically, descriptive statistics are presented, followed by a factor analysis that identifies four primary factors influencing preferences related to the utilization of seaplanes in Greece. The paper concludes by discussing the key findings and implications for both seaplane operators and governmental authorities.

2. LITERATURE REVIEW

As previously said, there has been limited research on the thoughts and attitudes of transport service consumers in Greece about seaplanes' quality, economic, and environmental characteristics. Two studies conducted by Ballis et al. (2018) in Crete (the first in 2015 and the second in 2017) revealed that 93% and 83% of tourists, respectively, were open to traveling by seaplane. Additionally, more than half of the travelers were willing to use seaplanes for multiple trips. Andrade et al. (2023) pointed out that the duration of the journey, ticket cost, and travel convenience are the primary factors influencing travelers to choose seaplanes. Through a SWOT analysis, they concluded that the successful establishment of seaplanes as a mode of transport hinges on

improving sustainable transportation, connecting isolated regions, and fostering economic growth in those areas. It is noteworthy that only 8% of seaplane companies are based in Europe, indicating a lag in operations compared to North America, Oceania, and the Maldives in this regard. Mohr and Schomann (2011) highlighted the issue of pilot availability as a significant challenge.

Residents in Greece place a high priority on safety when it comes to choosing seaplanes as a mode of transportation (Castelluccio et al., 2016; Kalogeri et al., 2019). Seaplane companies are expected to demonstrate their commitment to safety by implementing robust safety management systems, providing thorough training to pilots and ground staff, and upholding the highest standards in aircraft maintenance (Andrade et al., 2023). Safety concerns stem from the unique challenges of Greece's geography and weather, including strong winds, powerful currents, and narrow waterways (Kalogeri et al., 2019). Operating seaplanes in Greece requires a high level of technical expertise due to the complex nature of these machines, which combine aviation with shipping. Therefore, implementing strong safety management systems is crucial to mitigate risks and ensure the safe operation of seaplanes. The operation of seaplanes in Greece is governed by various regulations and guidelines established by national and international authorities, such as the International Civil Aviation Organization (ICAO) and the European Aviation Safety Agency (EASA). These regulations include airworthiness, crew qualifications, maintenance, and operational procedures (Favro et al., 2016). Companies involved in seaplane operations in Greece, whether in flight operations, customer service, or infrastructure development, must adhere to these regulations to ensure operational legitimacy (Castelluccio et al., 2016).

Seaplanes offer significant advantages in terms of accessibility and time savings (Andrade et al., 2023). They can reach remote or inaccessible locations that are challenging to access by road, air, or ferry (Ballis et al., 2018). Furthermore, Setiawan (2021) highlighted the high fixed costs of air travel in certain areas, making it less cost-effective, while the construction of necessary rail and road infrastructure is rugged in places like islands. This makes seaplanes an appealing choice for both tourists and locals, offering a more efficient and convenient mode of transportation. As noted by Kalogeri et al. (2019), the demand for seaplane transportation peaks during Greece's summer travel season.

Water ports are ideally located inside bays, gulfs, and sea areas protected from the main wave patterns. On the other hand, the least favorable areas include those stretching southeastward between the Dodecanese complex and the Cyclades, as well as locations in the Peloponnese and Crete. These regions are susceptible to long-term swell formations, which can present challenges for port operations (Kalogeri et al., 2019). In addition, the country's lakes are an important hub that enables, on the one hand, the development and conduct of seaplane routes (organized/regular, charter as well as tourist tours) and, on the other hand, the opportunity to combine the operation of water ports with that of airports and ports to create an effective infrastructure network. It's a fact that different modes of transportation complement each other rather than simply acting as substitutes. Kundur (2012) explains that in the Maldives, travelers arriving at the airport must be transferred by ferry or seaplane to different vacation destinations, an example of multimodality. When considering the considerably shorter travel duration compared to traveling by ship, the accessibility and time-saving advantages become evident, particularly for short distances. It is noteworthy that for the routes "Split-Jelsa," "Split-Lastovo," and "Split-Vela Luka," the seaplane transit time averages 22% of the ferry transit time (Favro et al., 2016). Additionally, flying by seaplane from Vancouver to Vancouver Island takes approximately 15 minutes, while the ferry takes about 1.5 hours (Gobbi et al., 2011).

The ticket price is a significant factor influencing the preferences of the community. Seaplane companies are required to carefully manage the cost of their services to the needs and expectations of their target market to guarantee the sustainability of their business in comparison to other modes of transportation. Seaplane flights in Greece can be expensive compared to other modes of transport, such as ferries or buses. For Croatia, Favro et al. (2016) report that the seaplane ticket price is three times higher than the ferry. Andrade et al. (2023) point out that traveling by seaplane is 6-10 times more expensive than other options such as ferry and express train. From Vancouver to Vancouver Island, the ticket costs $145 for the aircraft and $15 for a boat transfer, and from Valetta (Malta) to Gozo, the single adult fare is roughly $50 on a seaplane and $5 on the boat. The price ratio is approximately ten to one (Gobbi et al., 2011). The main reason is that a seaplane's fuel consumption per flight exceeds engine-powered vessels over the same distance. This can deter some locals, especially those with limited incomes. More generally, in order for seaplanes to be economically viable—that is, to cover costs and provide a reasonable profit for the owner—they need to be utilized at a rate of roughly 80% (Ballis et al., 2018). Traffic can be shifted throughout the day, and peak demand can be moderated with flexible pricing. However, according to Gobbi et al. (2011), Zelef (2014) and Ballis et al. (2018), seaplane companies that effectively promote their services through targeted marketing campaigns and partnerships with local tourism operators are quite likely to attract customers interested in the unique experience that seaplane travel offers.

When it comes to travel comfort and convenience, seaplane companies provide faster, and more comfortable transportation compared to ferry services (Iliopoulou et al., 2015). Additionally, they can access islands without airports, making them an appealing choice for travelers willing to pay extra for these services. For instance, the maximum affordable price for excursions to various destinations in Crete ranges from €63 to €75, depending on the number of stops. In contrast outside Crete (e.g., Santorini), the cost ranges from €80 to €100 (Ballis et al., 2018). However, seaplane companies offering only essential services may struggle to compete with other modes of transportation that provide similar services at lower costs. Additionally, seaplane trips provide passengers with the unique experience of flying over the seas and admiring the beautiful landscapes of Greek territory (Andrade et al., 2023; Gobbi et al., 2011). Sung et al. (2024) suggested that perceived luxury and novelty affect service evaluation, with Australians showing a stronger intention to use luxury seaplane services compared to Chinese tourists.

Finally, the environmental impact of seaplane operations is a key factor that can influence the preferences of the local population, and it has been the subject of study by various researchers. Seaplanes are often considered sustainable modes of transportation (Lue et al., 2016), as they have minimal impact on marine and aerial biodiversity and produce low levels of noise pollution (Andrade et al., 2023). In recent years, there has been a development of electric-powered seaplanes, which has further improved their environmental footprint (Lou et al., 2019). However, it's important to note that they can still have significant environmental impacts, especially in sensitive marine ecosystems. Therefore, seaplane companies are urged to demonstrate commitment to environmental sustainability by implementing measures to minimize their environmental impact and exploring alternative fuels (Favro et al., 2016).

3. METHODOLOGY

The selected research strategy employed a quantitative approach featuring structured questionnaires (Saunders et al., 2019; Schindler, 2019). The sampling process was conducted in 2022, collecting 443 valid questionnaires via electronic distribution (Google Forms). In particular, the study was executed within a defined timeframe, from May 13 to June 21, 2022, using a nationwide questionnaire disseminated through the Facebook social media platform. The surveys were distributed to participants utilizing transportation services in Greece. Ideally, the focus would have been on frequent seaplane users; however, the current trial phase of seaplane operations in Greece rendered this targeting impractical. A non-probability sampling technique was adopted, which, despite its inherent limitations - such as the potential for non-sampling errors - can yield a sample that is relatively representative of the broader population under certain conditions (Sarris, 2021). Representativeness is achievable when stringent procedures are implemented to ascertain the distribution of the characteristics of interest within the target population. A quota sampling method was employed, effectively maintaining gender proportionality in alignment with the demographic structure of the overall population. This approach was deemed essential considering the population's diversity and the inadequate availability of existing data (Sarris, 2021). Sampling units were selected by predetermined criteria, aiming to establish a sample reflective of the general population's characteristics. Consequently, the resultant sample can be considered representative (Dimitriadis, 2016). The Greek population is approximately evenly divided, roughly 50 percent male and 50 percent female. The sample mirrored this demographic distribution, comprising 208 men and 235 women, and culminated in a total of 443 completed questionnaires.

The questionnaire encompassed a total of 24 questions, of which the first 6 pertained to the demographic characteristics of the respondents (Q1-Q6) and 3 addressed existing travel habits (Q7-Q9) (Figure 1). Among the remaining 15 questions, 12 employed equivocal three (1:"No", 2:"Maybe", 3:"Yes")- and five-point ("1:not at all, 2:slightly, 3:moderately, 4:very, 5:very much") Likert scales (Q10, Q14-Q24) (Table 3) to investigate opinions regarding seaplanes as a mode of transportation, while the final 3 questions assessed respondents' likelihood of preference for future travel (Q11, Q12, Q13) (Figure 1). Notably, question Q12 included a web link to a seaplane flight, prompting respondents to articulate their emotions in response.

Both measures of central tendency (mean, median, and mode) and measures of dispersion (range, variance, and standard deviation) were employed as descriptive statistical measures (Chalkos, 2020; Gnardellis, 2013). The sample size for the 12 Likert scale questions was more than adequate since it was more than 20 participants for each variable and roughly 40 times larger than the questionnaire's questions (Dimitriadis, 2016; Norris et al., 2017). EFA was used to examine the construct's factorial validity as well as the suggested measurement scale's structure (Dancey & Reidy, 2020; Dimitriadis, 2016). It was suitable in our instance since the variables we used expressed the level of desire or satisfaction, the sample size exceeded one hundred, and the observations were unrelated to one another (Dimitriadis, 2016). The Varimax method (maximum variance rotation) was used to rotate the axes. This indicates that there was no linear correlation between extracted factors (components). The eigenvalue criterion (Eigenvalue≥1) determined how many factors were kept (Dancey & Reidy, 2020; Norris et al., 2017), and Cronbach's α coefficient was used to determine how reliable the questions were for the sample.

To assess the appropriateness of the data for factor analysis, we utilized the Kaiser-Meyer-Olin Measure of Sampling Adequacy (KMO) as outlined by Anastasiadou (2012). To ascertain the validity of the data analysis, specifically in determining if the correlation matrix of the variables under investigation significantly deviated from unity, Bartlett's Test of Sphericity (BTS) was employed as recommended by Dimitriadis (2016). The data processing was conducted using Statistical Package for Social Sciences 21 (SPSS), with a significant level of 5% established for all statistical analyses. Additionally, a higher significance level of 1% was specified for the assessment of sphericity to ensure rigor in the analysis. Aligned with the recommendations of Anastasiadou (2012) and Dimitriadis (2016), only variables with loadings exceeding 0.3 were considered for interpretation and the formulation of axes, given the substantial sample size of over 350 respondents.

The factors derived from the factor analysis were utilized as continuous variables for subsequent inferential tests. It is important to note that we excluded question Q11: "How likely would it be that you would choose the seaplane for your travel if this option existed?" from this analysis. This variable was structured on a 5-point iso-interval Likert scale (ordinal). We opted to treat it as a separate dependent variable to assess the linear correlation between data sets.

To determine whether to apply parametric or non-parametric tests, we evaluated the assumptions of independence, continuity (interval data), homogeneity of variance, and normality (which requires a normally distributed data set) (Dimitriadis, 2016). The independence and continuity of the data arose from the research design and logic. For the third hypothesis, Levene's test was used, and for the fourth, the Kolmogorov-Smirnov test, which is commonly used in studies with larger samples (Emvalotis et al., 2006; Saunders et al., 2019). The existence of normal distribution was examined by the skewness and kurtosis tests, too (Papaioannou et al., 2016; Norris et al., 2017). We checked if the absolute values of skewness and kurtosis (for n<30) were everywhere less than 1.96 (Papaioannou et al., 2016).

The parametric tests involved the Independent Samples t-test and the One Way ANOVA, while the non-parametric tests involved the Mann – Whitney U test and the Kruskall Wallis H test, respectively. The main selection criterion concerned the number of levels of the independent variables (Gnardellis, 2013) (Table 1).

Finally, to establish the type of correlation between continuous variables or between continuous and ordinal variables, Pearson's and Spearman's correlation coefficients were searched according to the existence or not of normality in the frequency distributions (Anastasiadou, 2012; Norris et al., 2017). The null hypothesis was that there is no statistically significant relationship between them (Dimitriadis, 2016) and the existence of even a low correlation concerned values of the above coefficients greater than ±0.3 (Roussos & Tsaousis, 2020). Our primary focus was to explore the relationship between the likelihood of selecting a seaplane as a mode of transportation and the factors that highlight the advantages of seaplanes in terms of domestic development, environmental impact, economic footprint, and competition with other transport options.

4. RESULTS

4.1 Descriptive statistics

The descriptive data and results of the survey, with the highest relative frequency, are represented in Figure 1. Specifically, 53% of the survey respondents were women and 47% were men. Most of them belonged to the age group of 40-54 years (43.8%), they were residents of the regions of Crete (34.1%) and Attica (29.3%), and the main reason they trave-

led was leisure (43.8%). They were married with children (50.6%), graduates of higher education (84.4%), and employed in either the private (34.5%) or the public sector (32.5%). The frequency they traveled was 2-4 times a year (48.1%), using an airplane (47.6%) or a wheeled vehicle (38.6%). Their perspectives on the regions of Greece appropriate for developing water airports converged on the islands of Crete, the southern Aegean, the Ionian, the Sporades, and the Cyclades (24.6%). Freedom (38.8%) and joy (26.6%) were the primary emotions they felt watching the seaplane flight video.

Throughout the examination of the Likert scale consisting of 12 inquiries (Table 3), it was evident that survey respondents perceive seaplanes as a more environmentally friendly mode of transportation compared to conventional airplanes (91.4%) and ships (86.8%). Additionally, they express the belief that seaplanes are more cost-effective than airplanes (82.0%) and can potentially improve connectivity between islands (76.2%). Specifically, in terms of establishing water airports, respondents anticipate that seaplanes will contribute to the development and increased tourism visitation to various destinations (67.5%).

4.2 Comparison of means and proportions

During the factor analysis process, it is crucial to note that three-and five-point Likert scales were employed. We conducted factor analysis based on correlations, specifically standardized covariances to address this issue. This standardized the factorial scores (mean=0 and standard deviation=1), making them suitable for use in other inferential tests (Distefano et al., 2009).

Table 3 provides an in-depth analysis of the outcomes. The KMO sample suitability index of 0.783, exceeding the threshold of 0.6, indicated that the sample data were suitable for analysis. Furthermore, the BTS sphericity check ($p<0.01$) confirmed the validity of the specific analysis. The data were then organized based on their correlation to identify the factors that most accurately represent Greeks' perceptions of seaplanes as a mode of transportation.

Based on the analysis, three uncorrelated factors emerged, which explain 59.22% of the total inertia of the data. The internal consistency coefficient (Cronbach's a) showed satisfactory to acceptable consistency and reliability for these factors (>0.6) (Papaioannou et al., 2016; Markos, 2012; Dimitriadis, 2016) and was equal to 82.4%, 66.8% and 60.1% for the 1st, 2nd and 3rd factorial axes respectively. From the communality values, we found values greater than 0.5 for each question. This means that the measurements are of satisfactory quality from the three-factor model (Dancey & Reidy, 2020).

Based on respondents' opinions, the first factor (F1) explains 28.16% of the total variance through Varimax rotation and is primarily influenced by questions Q18, Q19, Q22, Q23, and Q24. Greek perspectives on the role of water airports and seaplanes in domestic development are effectively represented. When considering Cronbach's α coefficient, the value remains consistent at 0.824 even with an increase in the number of items, indicating robustness (Anastasiadou, 2012; Dimitriadis, 2016). The variables (items) have a mean value ranging from 3.707 to 4.113 units, equivalent to a range of 0.406. Overall, the scale scores show a mean of 19.25, a dispersion of 19.513, and a standard deviation of 4.417 units. Removing any of the five items comprising the scale will reduce the scale's reliability.

In the second factor (F2), which explains 20.71% of the total variance, questions Q14, Q15, Q16, and Q17 load. This factor encompasses statements related to the environmental and economic impact of seaplanes compared to ships and airplanes. As per Cronbach's α coefficient, if standard values of the variables are maintained, the coefficient remains unchanged at a value of 0.668, regardless of the increase in the number of items. The variables (items) have an average value ranging from 2,830 to 3,377 units, representing a range of 0.547. Meanwhile, the overall scale scores demonstrate a mean of 12.79, a dispersion 3,945, and a standard deviation of 1,986 units. Removing any of the four items comprising the scale will result in decreased reliability.

In factor F3, which accounts for 10.36% of the total variance, questions Q10, Q20, and Q21 load. These questions gauge respondents' views on the comfort and safety provided by seaplanes in comparison to ships and airplanes. Upon standardizing the values of the variables, Cronbach's α coef-

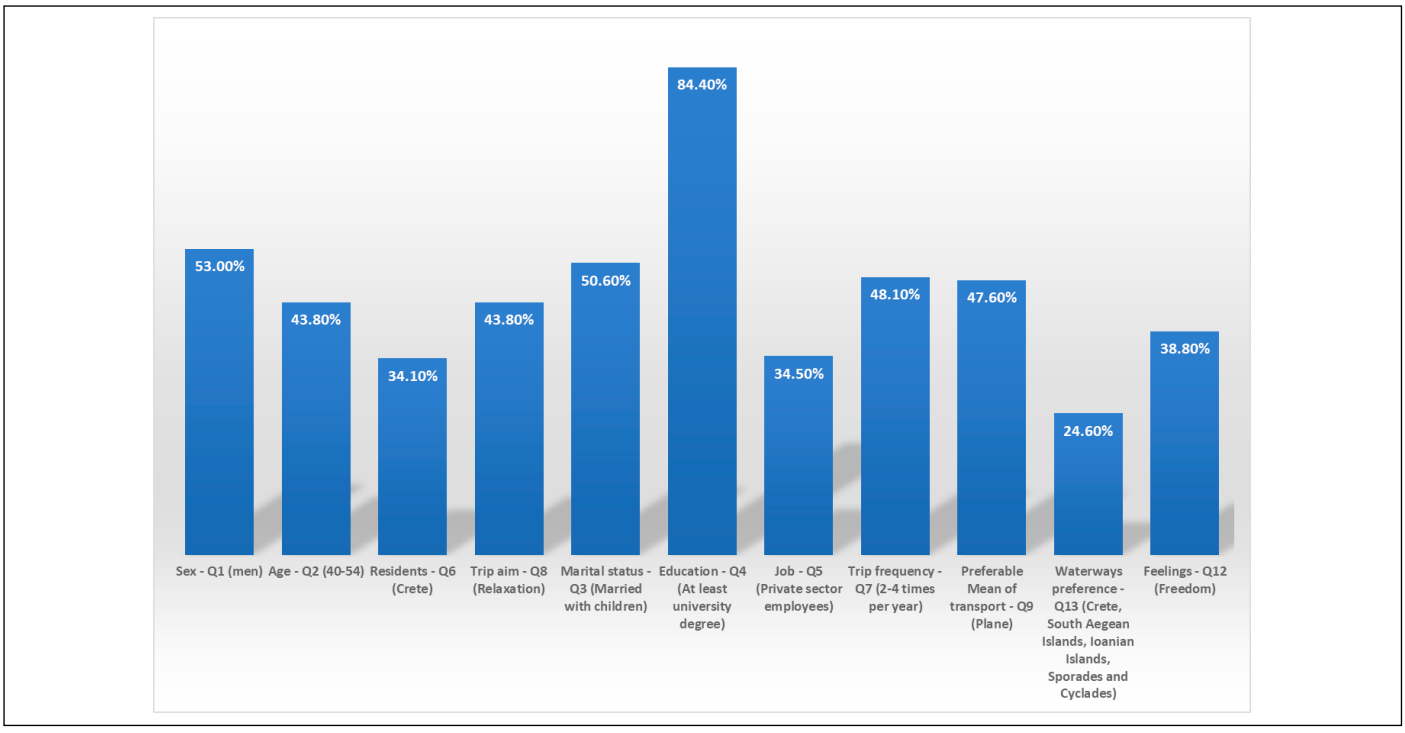

Figure 1. The prevailing percentage results of the descriptive statistical analysis (in parentheses are the answers of the respondents with the highest relative frequency).

ficient increases slightly (0.616), indicating a potential rise in cost with an increase in the number of items. The variables (items) exhibit a mean value range of 2,669 to 3,711 units, equating to a range of 1,041, while the overall scores for the scale show a mean of 9.38, a dispersion of 3,412, and a standard deviation of 1,847 units. Removal of question Q1 increases the scale's reliability coefficient (0.630). It is worth noting that the low value of Cronbach's α coefficient can be attributed to the limited number of items loaded on the specific factor (Papaioannou et al., 2016).

The factor scores, representing the values of the new variables, were acquired using the regression method and were standardized, as explained by Dancey & Reidy (2020). We decided to save factor indices as variables in this process. This approach relies on the least squares method to establish a relationship between the actual values and those predicted by the factor model, resulting in factors with a mean value of zero (Karlis, 2003; Distefano et al., 2009). As a result, the subsequent continuous variables were identified and utilized in the inferential analyses of the research data, as outlined in Table 1.

F1: The contribution of seaplanes and water airports to domestic development.
F2: The environmental and economic footprint of seaplanes compared to ships and airplanes.
F3: The comfort and safety offered by seaplanes compared to ships and airplanes.
F4=Q11: The probability of choosing the seaplane, as a means of transportation if this option existed.

It is important to mention that when the score of a factor is 0, the attitude of the person compared approaches the average of the sample. Likewise, a negative score means a less favorable score, and a positive score a more favorable one. All this is true due to the fact that the variables showed positive loadings (Distefano et al., 2009). Thus, statistically significant differences between these variables and the levels of the independent research variables were observed only between the gray surfaces of Table 1, and these cases are analyzed below.

In the context of factor F3 and its relation to the variables "sex" (Q1), "age" (Q2), "job" (Q5), and "feelings" (Q12), the Levene's test for equality of variances did not show statistical significance (p>.05). By using the t-test for independent samples, we investigated potential differences in the perception of this factor between men and women (Q1). The results indicated statistically significant differences (t297=3.243, p<.01). Men (mean=0.1865, s.d.=1.01) scored higher than women (mean=0.1828, s.d.=0.96). Furthermore, a One-Way ANOVA was conducted to explore differences between F3 and the levels of independent variables Q2, Q5, and Q12. The analysis revealed statistically significant differences (Q2: F3,295=7.459, p<.01; Q5: F5,293=3.276, p<.01; Q12: F5,293=13.147, p<.01). Subsequently, the Scheffe and Bonferroni tests were employed to determine between which levels of the independent variables statistically significant differences existed (Gnardellis, 2013). The results showed that within Q2, the age group of 55 and over (mean=0.45 ± 1.01) scored higher in the F3 factor compared to the age groups 40-54 (mean=0.06 ± .98) and 25-39 (mean= -.34 ± .95). This suggests that older age groups prioritize comfort and safety when choosing a seaplane as a means of transportation. Similarly, variable Q5 yielded comparable results, with retirees (mean=.74 ± 1.09) scoring higher than private sector employees (mean= -.15 ± .97). Regarding variable Q12, feelings of joy (mean=0.24 ± .90) scored higher on the F3 factor than feelings of fear (mean= -0.84 ± .86) and absence of feelings (mean= -0.39 ± .94). Additionally, feelings of freedom (mean=0.28 ± .92) prevailed over feelings of fear (mean= -0.84 ± .86) and the absence of feelings (mean= -0.39 ± .94). This indicates that "joy" and "freedom" are the primary feelings expressed by respondents about this factor.

In the analysis of Factor F4, a non-parametric test of two independent samples (Mann-Whitney U test) was conducted to explore the potential differences between men and women in terms of their likelihood to choose the seaplane as a means of transportation. The results exhibited statistically significant differences (U=19.236, p<.01), indicating that gender plays a significant role in the distribution of the F4 factor. Furthermore, it was noted that the medians of men and women were equal, yet the distribution of the F4 factor differed according to gender (Q1). The Mann-Whitney test, however, is known to be a robust test of medians only under the assumption of symmetric underlying distributions, which was violated in this dataset (Conroy, 2012). Consequently, it was observed that men had higher values than women, as evidenced by their higher sum of ranks. Additionally, it was found that both genders had equal 25th and 50th percentiles, with the first gender having a higher 75th percentile, mean, and mode. This observation supports the notion that the first distribution (men) is likely to have a higher rank-sum, indicating that men are more inclined to choose the seaplane than women. Moreover, the non-parametric test Kruskal Wallis H (Chalkos, 2020) was employed to investigate differences between the distribution of the continuous variable F4 and the levels of the independent variables Q2, Q6, Q7, and Q12. The analysis revealed statistically significant differences to the Q2 variable (Kruskal Wallis H=10.319, p<.01) between the 25-39 and 55 and over age categories, with individuals over the age of 55 showing a greater likelihood of choosing the seaplane as a transportation option. Similarly, statistically significant differences were observed for variable Q6 (Kruskal Wallis H=30.710, p<.01) between residents of the region of Crete and the region of Attica, with the former showing a higher inclination towards using seaplanes for transportation. This trend was also observed for variable Q7 (Kruskal Wallis H=10.054, p<.01) between the "up to 1 time a year" and "more than 4 times a year" categories, with individuals traveling more frequently having a higher propensity to choose seaplanes. Lastly, significant differences were found for variable Q12 (Kruskal Wallis H=101.669, p<.01) among the categories "fear-none", "fear-freedom", "fear-joy", "fear-security", "none-freedom", and "none-joy". Notably, feelings of fear outweighed feelings of freedom and joy when watching the seaplane video, and individuals without strong emotional responses were more likely to choose this mode of transportation than those experiencing feelings of freedom or joy.

In the analysis of the F2 factor, the non-parametric Kruskal Wallis H test was utilized to assess potential differences in the distribution of a specific continuous variable across the independent variables Q9 and Q12. Regarding variable Q9, the analysis revealed statistically significant differences (Kruskal Wallis H=8.262, p<.01) between the categories "by air" and "by road". Notably, individuals who frequently travel by air showed a higher average relative ranking than those who travel by road, indicating a preference for seaplanes as a more economical and environmentally friendly transportation option. Similarly, for variable Q12, statistically significant differences were observed (Kruskal Wallis H=16.324, p<.01) between the emotions "freedom-joy" and "none-joy". It was found that non-existent feelings and feelings of freedom were more prominent than feelings of joy while watching the video.

In our analysis of the F1 factor, we utilized a non-parametric Kruskal-Wallis H test to account for the non-normal

distribution of frequencies. Our study focused on variable Q4, exploring the influence of educational levels on people's perceptions of the role of water airports and seaplanes in domestic development. Our results revealed statistically significant differences (Kruskal-Wallis H=7.815, p<.05) between the "high school or high school graduates" and "master's or doctoral degree holders" categories. Specifically, individuals with higher educational levels strongly believed that seaplanes would significantly promote domestic development as a mode of transportation compared to those with lower educational attainment.

4.3 Correlation analysis

Extending our research, we examined the correlation between factors F1, F2, F3 and F4 (table 2). We were mainly concerned with the possibility of choosing the seaplane as a means of transportation (F4) concerning the other factors (F1, F2, F3). Depending on the normality or non-normality of the frequency distribution, we could choose as a methodological tool either the Pearson correlation coefficient (r) or the Spearman's rho correlation coefficient (ρ) (Roussos & Tsaousis, 2020). Finally, in all cases, the second correlation coefficient was applied (our data did not fit into a normal distribution). Besides, according to Khamis (2008), when an ordinal variable (F4) consists of a minimum of five levels, the Spearman rank correlation coefficient can be employed to evaluate the strength of the association between the ordinal variable and continuous variables (F1, F2, F3). This methodological approach facilitates a robust analysis of correlations across different data types.

In particular, non-parametric correlation analysis was applied to examine the relationship between travelers' likelihood of choosing seaplanes and their perception of their contribution to domestic development. The results showed that there is no statistically significant correlation between them (ρ=.069, p>.05). It was also examined whether there is a statistically significant relationship between the perception of the comfort and safety offered by seaplanes (compared to ships and airplanes) and the preference for them. A moderate positive correlation was found (ρ=.573, p<.01) (Roussos & Tsaousis, 2020). The same analysis was done for seaplanes' environmental and economic footprints (compared to ships and airplanes). We concluded that there is no statistically significant correlation between factors F2 and F4 (ρ=.106, p>.05).

5. DISCUSSION

Seaplanes have the potential to revolutionize tourism in Greece by introducing new destinations and providing a unique travel experience. Investing in this mode of transport would showcase the country's insularity and enhance its tourism offerings. However, there are various challenges to overcome, including regulatory obstacles, limited infrastructure, and the need for effective corporate marketing. Lengthy procedures for establishing and legalizing specially designed water ports are hindering operators. The primary goal should be to enhance the country's connectivity, promote tourism, and serve the citizens. Notably, Hellenic Seaplanes introduced the first seaplane to Greece in 2023, launching it in the Sporades. A subsequent seaplane is anticipated for deployment in the Ionian Sea; however, progress remains stagnant, resulting in continued connectivity issues between islands and the mainland, particularly in the northeastern Aegean region. It is pertinent to note that seaplane operations in Greece are currently in a testing phase, involving evaluating various destinations.

From a marketing perspective, seaplanes could appeal to a demographic within the tourist market that is more affluent and adventurous. This shift can potentially enhance business revenues while promoting a more equitable distribution of tourist traffic across different transportation modes. Research indicates that marketing strategies should be directed towards demographic segments characterized by lower educational attainment, road-based travel habits, female travelers, younger individuals, and private sector employees, as these groups often exhibit skepticism towards seaplane travel. Therefore, strategic efforts must be directed towards altering this perception, particularly by emphasizing the safety of seaplane travel, given the prevalent concerns surrounding it among prospective customers.

In the realm of transportation competition, conducting a comparative analysis of seaplanes against alternative transit modes is crucial. The selection of transport mode is influenced by numerous parameters, with the interplay between the operational characteristics of a specific mode and its alternatives being particularly salient. Key factors for this analysis include flight frequency, trip duration, and average ticket pricing. Presently, seaplane operations in Greece remain within a testing phase with scheduled flights to various destinations; thus, definitive conclusions on their viability cannot yet be established. However, preliminary announcements from Hellenic Seaplanes have suggested indicative ticket prices for various routes. For instance, the anticipated fare for the route from Athens to Paros is approximately €69 per person. In contrast, the lowest fares offered by ferries and airplanes for this identical route in August 2025 are projected at €74 and €89, respectively (Ferryhopper.gr, 2024; Skyscanner.com, 2024). This preliminary data suggests that seaplanes may provide a competitive and economically viable mode of transportation, as asserted by the company that "the tickets will cost a similar price to that of the ferries." (Hellenic-seaplanes.com, 2024).

Methodologically, we recognize that employing a non-probability sampling technique introduces a risk of systematic error and limits the capacity to calculate random error. Since the research participants were not selected randomly, the findings may not be generalizable to the broader population. However, this method is commonly used in educational and psychological research contexts. Future studies on this topic could benefit from adopting a sampling methodology that reduces subjective bias and ensures a more systematic selection of observation units, thereby enhancing the validity of the results. Additionally, further research could explore how the actual evaluation factors (F1, F2, F3) impact the likelihood of selecting a seaplane as a mode of transportation (F4) and identify which factors are the most significant. To address this research question, we recommend utilizing multiple regression analysis. The ultimate goal is to estimate the overall predictive power of the variables involved, specifically determining the percentage of variance explained by the predictor variables included in the regression equation.

6. CONCLUSIONS

The present study aimed to examine the attitudes and perceptions of transportation service users in Greece regarding seaplanes, as well as to identify their qualitative, economic, and environmental advantages and disadvantages compared to traditional modes of transportation such as ships and airplanes. The findings of this research hold significant implications for both industry stakeholders and governmental decision-makers. Companies can utilize the results to formulate targeted marketing strategies to promote seaplanes as a viable transportation alternative, while the government can use the insights to inform future policy decisions.

Question	Factor List	Dependent List			
		F1 from FA	F2 from FA	F3 from FA	F4=Q11
	Demographic Characteristics		***Inferential Tests***		
Q1	*Sex*	Mann-Whitney U test	Mann-Whitney U test	Independent Samples t-test	Mann-Whitney U test
Q2	*Age*	Kruskall Wallis H test	One Way Anova	One Way Anova	Kruskall Wallis H test
Q3	*Marital status*	Kruskall Wallis H test	One Way Anova	One Way Anova	Kruskall Wallis H test
Q4	*Education level*	Kruskall Wallis H test	Kruskall Wallis H test	One Way Anova	Kruskall Wallis H test
Q5	*Job*	Kruskall Wallis H test	One Way Anova	One Way Anova	Kruskall Wallis H test
Q6	*Prefecture of residence*	Kruskall Wallis H test	One Way Anova	One Way Anova	Kruskall Wallis H test
	Travel Habits	**F1 from FA**	**F2 from FA**	**F3 from FA**	**F4=Q11**
Q7	*Trip frequency*	Kruskall Wallis H test	Kruskall Wallis H test	Kruskall Wallis H test	Kruskall Wallis H test
Q8	*Trip aim*	Kruskall Wallis H test	One Way Anova	One Way Anova	Kruskall Wallis H test
Q9	*Mean of transport*	Kruskall Wallis H test	Kruskall Wallis H test	One Way Anova	Kruskall Wallis H test
	Preference for seaplanes	**F1 from FA**	**F2 from FA**	**F3 from FA**	**F4=Q11**
Q10	*Seaplane safety*	x	x	x	x
Q12	*Feelings*	Kruskall Wallis H test	Kruskall Wallis H test	One Way Anova	Kruskall Wallis H test
Q13	*Water ports in Greece*	x	x	x	x

Note: Gray surfaces show statistical significance differences

Table 1. Appropriate inferential tests between dependent and independent research variables

	Scale Variables	*F1 from FA (Spearman's rho)*	*F2 from FA (Spearman's rho)*	*F3 from FA (Spearman's rho)*	*F4=Q11 (Spearman's rho)*
1	*F1 from FA*	X	-.045	.016	**.069**
2	*F2 from FA*	-.045	X	.003	**.106**
3	*F3 from FA*	.016	.003	X	**.573****
4	*F4=Q11*	**.069**	**.106**	**.573****	X

**P<.01, *P<.05

Table 2. Correlation analysis between continuous variables F1, F2, F3 and F4

Question	Questions' content	Prevailing valid percent	"Maybe to Yes" or "Much to Very much" percentage	Factors	Scale items	Factor loading F1	F2	F3
Q10	How safe do you think seaplanes are?	Much (39.1%)	59.6%	**F1:** The contribution of seaplanes and water airports to domestic development	Q18	0.729	x	x
Q14	Do you believe seaplanes offer a more ecologically sustainable travel option in comparison to traditional air travel?"	Maybe (46.1%)	**91.4%**		Q19	0.780	x	x
Q15	Do you believe that seaplanes may offer a more sustainable travel option in comparison to traditional ships?"	Maybe (45.5%)	**86.8%**		Q22	0.835	x	x
Q16	Do you believe that the seaplane will offer a more cost-effective mode of transportation than traditional airplanes?	Yes (43.2%)	**82.0%**		Q23	0.798	x	x
Q17	Do you believe that the cost of using a seaplane for transportation will be more economical than traveling by ship?	No (41.7%)	58.4%		Q24	0.801	x	x
Q18	To what extent do you believe that the seaplane will enhance the transportation connections between the island regions and mainland Greece?	Very much (39.3%)	55.6%					
Q19	To what extent do you believe the seaplane has the potential to enhance the transportation connectivity among the various islands?	Very much (46.0%)	**76.2%**	**F2:** The environmental and economic footprint of seaplanes compared to ships and airplanes	Q14	x	0.667	x
Q20	Do you predict that seaplanes will offer a more comfortable mode of transportation than traditional airplanes?	No (46.8%)	53.2%		Q15	x	0.676	x
Q21	Do you believe that utilizing a seaplane will provide a higher level of comfort in trave l as opposed to traveling by ship?	Yes (34.6%)	66.9%		Q16	x	0.753	x
Q22	To what extent do you believe that the creation of water airports will aid in the continued growth and enhancement of a tourist destination?	Very much (44.2%)	**67.5%**		Q17	x	0.719	x
Q23	To what extent are you of the opinion that the development of water airports will bolster job growth in the surrounding area?"	Very much (38.6%)	53.9%	**F3:** The comfort and safety offered by seaplanes compared to ships and airplanes	Q10	x	x	0.713
Q24	To what extent do you believe that the creation of water airports will capture the attention of potential foreign investors?	Very much (34.5%)	55.7%		Q20	x	x	0.761
Note: The table highlights the top five highest percentages ("Maybe to Yes" or "Much to Very much") by displaying them in bold text.					Q21	x	x	0.793

Reliability Statistics	Cronbach's Alpha (F1)	Cronbach's Alpha (F2)	Cronbach's Alpha (F3)
	.824	.668	.601

KMO and Bartlett's Test	Kaiser-Meyer-Olkin Measure of Sampling Adequacy		**Bartlett's Test of Sphericity**	Approx. Chi-Square	1062.873	Sig.	0.000
	.783			df	66		

Total Variance Explained			Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
			Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
	Rescaled	1	3.379	28.155	28.155	3.379	28.155	28.155	3.145	26.210	26.210
		2	2.486	20.713	48.868	2.486	20.713	48.868	2.122	17.680	43.890
		3	1.243	10.357	59.225	1.243	10.357	59.225	1.840	15.335	59.225

Table 3. Descriptive statistical data regarding the responses to the 12 Likert scale questions and the findings obtained through the exploratory factor analysis

Existing academic literature on this subject is limited and primarily centers on factors such as "safety," "accessibility," "time savings," "ticket prices," "amenities," "travel experience," and "environmental impact." To address this gap, our research adopted a quantitative approach, employing structured questionnaires as the primary data collection method. Through the application of exploratory factor analysis, the resulting factors were utilized as continuous variables for subsequent inferential statistical tests, both parametric and non-parametric, revealing that they accounted for 59.22% of the total variance in the data.

The inferential analyses yielded several noteworthy insights. Firstly, individuals with higher levels of education exhibited a stronger belief in the potential contribution of seaplanes to domestic development compared to those with lower levels of education. Secondly, frequent air travelers were more inclined to perceive seaplanes as a more cost-effective and environmentally friendly transportation option than those who primarily traveled by road. Additionally, the analysis of respondents' emotional responses to a seaplane trip indicated that feelings of non-existence and freedom were more prevalent than feelings of joy. Furthermore, in terms of perceptions of "comfort" and "security," men scored higher than women, with older individuals placing greater importance on these aspects, particularly retirees in contrast to private sector employees. "Joy" and "freedom" emerged as the predominant emotions associated with seaplanes among the respondents. The analysis of respondents' likelihood of choosing seaplanes as a mode of transport, particularly concerning demographic and travel behavior variables, revealed several interesting patterns. Men were more inclined than women to opt for seaplanes, with older age groups (over 55) showing a higher preference than younger individuals (25 to 39). Residents of Crete exhibited greater receptiveness towards seaplanes than those from Attica, and individuals who traveled more frequently each year (before the pandemic) for leisure, business, or personal reasons also displayed a higher inclination towards seaplane travel. Interestingly, individuals who expressed no specific emotions regarding seaplanes were more positive about them than those who reported feelings of freedom or joy, with fear being a less prevalent emotion compared to feelings of non-existence, ambivalence, and security.

Finally, the correlation analysis conducted between the likelihood of choosing seaplanes and the three identified factors revealed a moderate, positive correlation, specifically between the perception of comfort and safety offered by seaplanes in comparison to ships and airplanes, and the preference for seaplanes as a mode of transportation.

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