Manuscript title: Exploratory Analysis of Seaplanes Operations in Greece: Insights of a Survey and SWOT analysis

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Abstract

Seaplanes as a transport mode provide the flexibility of using land and water infrastructure for their operations. This functionality presents an opportunity for regions with water surfaces, especially when the sea and air connectivity are the only options. This paper presents an exploratory analysis of seaplanes' potential as a mode of transport in Greece. After reviewing the topics of air connectivity, remote regions and the coexistence of modes of transport, a survey is designed to collect information on the perspectives of potential users in the Greek region. In total 200 replies of residents and non-residents of the country are collected and reflect a social perspective of seaplane operations. It is found that the main aspects that would motivate passengers to choose seaplanes would be the offered trip duration, the ticket price and the trip convenience. The collected information is used for the elaboration of SWOT analyses that assess seaplane operations at a strategic decision-making level in transport planning and technology management. The analysis concludes that the potential of seaplanes as a transport mode lies on the enhancement of sustainable transport, the connectivity of isolated regions and their economic growth.

1. Introduction

Seaplanes are a mode of transport that allows short to medium distance journeys with origin and destination nearby water. Some seaplane types, like the amphibious, are equipped with a landing gear that allows them to land not only on water but also on land (Gobbi et al., 2011; Odedra et al., 2004) enabling them to use multiple transport infrastructure types. The required infrastructure is minimal compared to the other modes since in addition to the landing and take-off runway, which is located on water, it is only necessary to connect the seaplanes to the shore and a water lane to allow their take-off and landing manoeuvres (Federal Aviation Administration, 2018; Odedra et al., 2004; Quilty et al., 2015). Compared to ferries, even though emissions per minute are higher for seaplanes, the journeys are done in a significantly shorter time ending up being less pollutant overall (Gobbi et al., 2011). Quilty et al. (2015) identified as possible contributions of seaplane operations, their potential to enhance the national transport system, the offering of an alternative transport mode to the users and finally, the opportunity to foster the development of local economies with a particular emphasis on remote regions.

Industrial applications of seaplanes have proven that they can satisfy passenger needs. As a mode, seaplanes are especially important for remote areas where ports are already available but the construction of an airport may be unprofitable due to low demand and the high investments required or where the construction of airports is impossible due to terrain constraints (Braathen, 2011; Fageda et al., 2018). Despite these limitations, transport accessibility for people and goods cannot be restricted, which is why even if for airline operators it may not be profitable to operate routes in such regions, travel connectivity still needs to be ensured and for this purpose governments provide support and incentives to airlines or passengers so that they can continue carrying out the necessary journeys with the support of Public Service Obligations in Europe or Essential Air Services in the United States (US

Department of Transportation, 2016; Wittman et al., 2016). Previous studies have analyzed the development of such air transport networks (Pita et al., 2013, Pita el al., 2014, Wittman et al., 2016, Leandro et al. 2021). The transport demand in these networks could potentially be served by seaplanes as well, particularly for short journeys that carry few passengers, thereby reducing costs and freeing up space at airports for medium and long flights which are less profitable to be run by seaplanes. People living in islands or remote regions is a clear segment of the population that can benefit from the introduction of seaplanes in a country. However, the service can also be employed to satisfy touristic demand in peak touristic periods.

Notwithstanding the success stories and frequent use of seaplanes in the North American continent and in touristic resorts linked by islands such as the Maldives, in the European continent the adoption of this mode of transport is scarce or absent despite the vast number of countries adjacent to the oceans, seas, rivers and lakes. Greece is a European country with great potential for developing seaplane operations due to the high number of inhabited islands and the great number of tourists. Considering covid-free touristic demand, in 2018 approximately 30,123 million people visited Greece making the country the 13th country in the world with the highest annual number of tourist arrivals (Eurostat, 2020; Wolf, 2019). Many of the country´s islands are small making airport construction a difficult task and sometimes even impossible. Therefore, many of the islands have ferries as the only transport mode accessible which is a slower mode of transport and the journeys may be long and tiring. As seaplanes do not need large infrastructures for their operations, they can function as an alternative to airplanes and ferries, allowing residents and visitors to have greater choices and improved experiences. Lastly, the country is still the second-largest European member state with 72,500,000 passengers travelling by sea which shows the high travel dependence on sea for residents and non-residents.

This paper aims to analyse the potential of seaplane business operations in Greece from a user perspective and provide a series of considerations for the establishment of seaplane business in the country. The developed work is two-fold. First potential user perspectives are explored and then the business environment is analyzed. The rest of the document is structured in six sections. After the introduction of the topic, the second section presents knowledge and information of previous studies that are employed in the current study. Then the third section presents the methodology adopted for the paper and the tools used to achieve the goals of the article. The fourth section shows the main results of the research and the fifth section discusses them. Finally, the paper concludes with final considerations, key research findings, implications for business and study limitations and suggestions for future research.

2. Theoretical Background

Transport networks and, especially, air networks allow movements of people in long distances independently of the geomorphological landscape. Air connectivity can be defined as the degree to which various points on a network are connected through an aerial connection (Burghouwt, 2017; Burghouwt & Redondi, 2013) and takes into account not only the number of flights taking place at an airport but also the destinations of these flights. Connectivity can be assessed in three distinct ways: (a) direct for flights from the airport to destination without stops; (b) indirect for flights with one or more stops; and lastly (c) connectivity of the Hub in the case where the airports act as the transfer point between destinations. In the past performance measures such as the speed of routes, average travel costs and the number of direct or indirect routes provided by an airport have been considered to assess how good the air connectivity level is (Burghouwt, 2017; International Transport Forum, 2019).

Air transport networks have allowed international trade to grow and bring improvements in commercial transport as well. The liberalisation of air transport has led to a

rise of passenger volumes, resulting in benefits related to transport productivity, domestic and international trade and GDP growth (interVISTAS, 2015). Many authors advocate the role of transportation expansion to economic development. In terms of local mobility, improvements in connectivity allow for shorter travel times thereby increasing the supply of workers to companies (Eddington, 2006).

Given the benefits of improving air connectivity, it is important to stimulate this expansion to remote regions. Remote regions are often described as isolated and sparsely populated areas with particular geographical, cultural and institutional characteristics and where third party involvement is required to get connections to the mainland (Fageda et al., 2018; Leven, 1986). Remote regions can be islands, outermost territories and regions with political requirements (Fageda et al., 2018). Such regions require external intervention since minimum transport services must be provided. Since air transport is subject to high fixed costs it is not cost-effective in all regions. In regions such as islands it may be challenging to develop infrastructure for rail and road transportation. It is in these areas where the potential for operating a network of seaplanes arises and the potential diffusion of the technology relies on local and cultural aspects as well (Setiawan, 2020).

Public service obligations are subsidies that are allocated to airlines to enable them to provide and maintain routes to communities that would not have them otherwise. Such subsidies must be granted primarily to regions where the operation of a transport service would be unprofitable as a result of poor demand and therefore the government must intervene to ensure that the transport service is provided even when it is not profitable (Braathen, 2011; Fageda et al., 2018). While countries in Europe must follow the general legal regime of the European Commission, they remain flexible in defining which routes and fares they choose to operate. In the case of Norway, the trade-off in reducing ticket prices as a result of subsidies

led to an increase in the number of people willing to travel and surpluses for both the companies and consumers (Braathen, 2011).

It is still not identified how seaplanes will fit in within the existing transport system in Europe and Greece, specifically, and how they will provide competitive advantages to compete with other modes, on air, sea and ground transport. Factors such as low demand during off-peak season, adverse weather conditions and poorly developed infrastructure impact both air and sea transport (Iliopoulou et al., 2015). Although sea transport may be presented as a more affordable option and hence, preferable in the market, factors such as distance and sea conditions can favour air transport (Rigas, 2009). Helicopters are also among the transport modes that can offer a similar contribution to seaplanes as they do not require the construction of major infrastructure for their operations. They offer further advantages to travel under worse conditions than seaplanes which are dependent on sea conditions and wind. However, they are not competitive in terms of speed, comfort and flexibility (Castelluccio et al., 2016).

A challenge for seaplane operations could be the trip cost. A seaplane journey is on average 6 to 10 times more expensive than other options like ferries and high-speed trains, when the latter ones are available (Gobbi et al., 2011). Examples of this price ratio were detailed in Canada where a trip between Vancouver and Victoria takes 1 hour and 35 minutes with a price of 17.20 Canadian dollars if done by ferry and if done by seaplane it only lasts 30 minutes but has a price of 150 Canadian dollars. Between Malta and Gozo while seaplanes were still operating this service was priced at approximately 50 Euros, whereas the same route by ferry was priced at 5 Euros for the same route. These are two examples that corroborate the ratio. Due to the standard rates, it is unlikely that a seaplane journey will be profitable for short term journeys as the cost of losing a few more minutes of travel does not offset the payment of a substantially higher amount. Seaplanes can be used profitably and in complementarity with other modes of transport in tourist destinations with many islands. In the Maldives, passengers

arriving at the airport need to be transferred to the various holiday resorts and can be carried via ferries or seaplanes (Kundur, 2012). In this case, seaplanes are used as a complement to the airports.

The different topics covered in this section highlight the role and benefits that air transport offers in the development of the locations in which it is active. In the face of globalisation and the resulting growing need for mobility of people and goods, the development and expansion of such modes of transport are becoming more important for the economic growth and development of these areas. Less developed and isolated regions are likely to have lower levels of demand resulting in reduced traffic, rendering airport construction and route operation unprofitable for airlines. To address this issue and not to hinder accessibility for residents of these regions, governments enhance connectivity through Public Service Obligations. Nevertheless, due to certain issues arising from the development of air transport, including the demanding infrastructure development and maintenance, other modes could also be considered. Ferries have some shortcomings, such as long journey times, making this mode of transport less attractive, particularly between geographically distant regions. The potential of seaplanes is therefore evidenced by the fact that they are quicker compared to ferries and by their flexibility to land on sea in contrast to aircrafts that cannot land on sea.

3. Methodology

The purpose of this paper is to present several factors to be taken into consideration when creating a strategic plan for a network of seaplanes in Greece. The first seaplane operations in Greece commenced in 2005 with an investment of approximately 20 million euros by the AirSea Lines company. It was also in this year that the first legislations (3333/2005) were enacted focusing on issues such as charter flights, the use of seaplanes for medical emergencies and the limit of three daily flights per destination. Among the judicial authorities, the

bureaucratic challenges caused substantial delays in the elaboration of the definitive measures, resulting in the end of business, particularly because at that time it was not possible to establish a base of seaplanes in Athens (the main tourist destination) and the increase of the operational costs. The most recent legislation (4663/2020) in the country has been an important basis for development and recent encouragement for seaplane operations.

Currently, few companies are the main candidate operators of seaplane operations and are pending the green light from the Government to start their operations. Current challenges are the slow processes for the preparation and legalization of water ports and, as such, there are few legalized ports with few destinations, and the penetration to the market in a profitable way. The companies plan to offer similar services, including scheduled flights, transfers between resorts, recreational landscape flights, and to serve rescue and medical emergencies.

As accessibility and policy needs should be aligned and both stem from citizens´ needs (Straatemeier and Bertolini, 2020), to address the opinion of potential users, an anonymous survey is designed and data is collected to understand the market´s perspectives on seaplanes. Then three SWOT analyses were performed considering the survey results to assess the business potential of seaplane operations in Greece. The first is the traditional SWOT combining external factors with internal ones and identifying market opportunities possible threats and their impact. The second approach is called systemic SWOT and is used as an action tool that complements the traditional SWOT analysis and shows how external opportunities and threats can be adjusted to the company's internal strengths and weaknesses, so that interesting strategies are drawn up for the company. The third approach is called SWOTi, or SWOT ISCTE, and focuses on the values and impact of the business on the society. When, for example, we analyze the actions that we can implement in order to take advantage of the company's strengths taking into account the opportunities of the environment, we should

always question if the actions are in accordance with the values of the organization and if the actions will have a positive or negative impact on environmental, social and economic aspects.

3.1. Survey Design

The survey consists of 4 sections:

- Section 1 includes socio-demographic questions to better understand the profile of the respondents and to familiarise them with the software and the survey´s content.
- Section 2 collects information on the travel behaviour of respondents. Specifically, it is asked if they have ever travelled between islands on the Greek territory and if yes, the frequency of these trips. The most frequent transport mode to connect with islands is asked along with the trip purpose and the price usually paid. Finally, the respondents are asked to assess the importance of a set of chosen factors for inter-island trips.
- Section 3 introduces seaplanes, the reasons why they are being studied and the respondents are asked to assess the likelihood of using this service in the future and select the four features they considered most important for using it. Following this, a travel route is presented with the prices charged and the trip duration for the same route by ferry and plane and respondents are then asked to choose an option for the price they would be willing to pay for a seaplane trip with the same characteristics.
- Section 4 concludes the survey with the questions of whether respondents would still be interested in using this service if the journeys were carried out in a circuit, increasing the duration of the journeys but reducing the price and the value that would keep them interested in using the service given these new conditions.

3.2. Data collection and Sample Description

The anonymous online survey was distributed through social networks and was

circulated in social groups of Greek residents and former residents or non-residents who had previously travelled within the country. Data was collected using a random sample according to the availability and accessibility of the respondents and could be current Greek residents or non-residents who had already been in the country and had done trips between islands. Almost all the questions were closed questions with the presentation of options but allowing for the registration of another option if no solution was in line with what the respondent considered.

Overall, 240 responses were collected from both Greek residents (60%) and previous visitors or former residents that had undertaken trips between islands (40%). Out of the people residing in Greece, 70% live in the continental part and 30% in the islands. For any individual not belonging to one of these groups, the survey ended and their responses were not considered. Table 1 presents the characteristics of the sample.

(Please insert Table 1 here)

4. Results and Discussion

4.1. Potential users' perspectives on seaplane operations

To better understand the type of people who would be willing to use seaplanes as a mode of transportation, the respondents were asked about the type of trips and the purpose that led them to make trips between Greek Islands. More than half of the residents (56%) travel between islands once or twice a year (26% undertake two trips a year) while 12% travel to islands with high frequency (once or more per month) and 6% never travel to islands.

Table 2 presents the statistics of the 3 main purposes for which the respondents would use seaplanes. Most of the non-residents stated they would use them for leisure while the equivalent percentage of residents of Greece was lower. As expected, the proportion of residents wishing to use seaplanes for health reasons was higher than the equivalent of non-residents.

(Please insert Table 2 here)

Both groups of respondents also expressed the likelihood of using a seaplane if it was available in the country (Table 3). Regarding the residents of the country, 43% of the respondents were enthusiastic to travel across islands by using seaplanes and are characterized as "*promoters*" while 21% were "*passive*" to this possibility. On the other hand, 36% of the respondents most likely would not be interested in making trips using seaplanes and are characterized as "*detractors*". The responses of the non-residents group present similarities in comparison to those of the residents but have more passive respondents compared to the detractors and the promoters.

(Please insert Table 3 here)

Opposite to the current study, Gobbi et al. (2011) concluded low acceptance levels for the market of seaplanes in Europe. However the study took place much earlier and also the Greek population may be more familiarized since there have been attempts for the implementation of some seaplane business projects in territory. Iliopoulou et al. (2015) also supported that there is a market for the introduction of seaplanes in the Greek market naming some shortcomings of the Greek transportation industry, particularly of the ferries because of the circulation challenges with adverse sea conditions, long travel times and slow speeds.

The respondents were also asked the modes of transport that they most often used to travel between islands and the modes they believe would be competitors to seaplanes. The responses were similar for residents and non-residents with the majority of people believing that the ferry would be the competitor mode of seaplanes (77% residents and 75% non-residents) while the rates for the plane were lower.

Following a bottom-up approach and in order to designate the needs of people (Mehmood and Imran, 2021), the importance of the seaplane operational features was also addressed in the survey and the results are presented in Table 4 and Table 5. Price was

considered the most important feature with 80% of the non-residents describing this feature as either very or extremely important while the equivalent percentage of residents was slightly lower (78%). The results presented support as well the arguments presented by Rigas (2009) that ferry due to economic motives are preferentially selected for connections between islands as the respondents' choices greatly reinforced the importance of price for these trips. However other factors such as great distance and possible adverse sea conditions may lead to this preference (albeit in a smaller proportion) for an air transport mode.

Waiting time was the second most important feature for residents while for non-residents, the length of journeys was chosen as the second most important feature considering it either very or extremely important. Previous works have also highlighted the importance of time requirements of seaplanes for tourism demand (Castelluccio et al., 2016).

One of the most significant features was also the trip convenience and this indicator is related to the accessibility level of people to the transport network. Therefore, the need for complementarity and multimodality arises. Current experience in Malvides, that has many islands as Greece, shows that seaplanes play a very relevant role by being profitable and used as the preferred mode of transport for transfers between Velana International Airport and the main resorts in the country (Kundur, 2012). Finally, the least important feature was the inclusion of tickets in a transport pass.

(Please insert Table 4 here)

(Please insert Table 5 here)

After being asked to evaluate the importance of a set of features that led them to pick the mode of transport they typically use to undertake inter-island travel, the respondents were then asked to pick the 4 most important features that would make them prefer seaplane trips versus the other alternatives. The results are presented in the following Figure 1.

(Please insert Figure 2 here)

For this question, the respondents said that the main reason would be the duration of the trips. Secondly, both residents and non-residents considered price as the second most important item with 18% and 23% share of responses respectively. Travel convenience and waiting times were considered the third and fourth most important feature. The inclusion of trips in a travel pass was considered the least important feature in both groups with only 2% of responses for residents and 0% for non-residents.

Considering the relevance of the price feature, it was asked how much they were willing to pay for a 40-minute non-stop direct trip or a route trip knowing that the equivalent boat trip would last 3h and cost 30€. The prices presented in the study of Pagonakis (2018) were adjusted assuming a starting price of 61€ and then the variations of increased prices were presented. The replies are presented below in Figure 2 with the majority of the respondents (~76%) seemed willing to pay up to 70€ which is the double price of the equivalent boat trip.

(Please insert Figure 2 here)

Respondents were then asked if they would be interested in continuing to travel by seaplanes if the journeys included intermediate stops. For this question, the journeys would take 2 hours instead of 40 minutes but would have a price reduction. Responses to this question were more mixed (Figure 3 below) but most respondents were willing to continue using this service if the trips lasted longer but were less expensive.

(Please insert Figure 3 here)

Respondents would be willing to do these journeys through a circuit, where instead of taking 40 minutes it would take 2 hours, in lower prices. 26% of respondents said they would be interested in making the trips by circuit if they had a 30% discount value. The remaining results are presented in Figure 4 below.

(Please insert Figure 4 here)

The respondents designated four main factors for undertaking seaplane trips: the trip duration, price, convenience and waiting times. To attract passengers for inter-island transportation it is important to be able to maintain efficient operations with a low duration in both waiting and travel times and above all maintain a competitive price. These conclusions support Gobbi et al. (2011) analysis which stated that one of the great advantages of seaplanes over competing modes of transport is their greater speed, resulting in shorter travel times. This is supported by Iliopoulou et al. (2015) that designed a set of possible routes to be flown by seaplanes that allow quick access to the Aegean Islands. The major benefits of introducing a route service besides the price reduction are the travel times that remain low, the low infrastructure requirements for take-off and landing, and improved connectivity to islands with poor accessibility. Although the developed routes consider minimization of costs, the research at this point is not focused on how much the consumers are willing to pay and their sensitivity to prices of the service. Considering the abovementioned replies, the operational flexibility of seaplanes and the fact that they are a less polluting mode of transport than their main competitors, seaplane operations can be further analyzed. The results of the survey assume that 62% of people would still be interested in making the trip through a circuit if there was a reduction of approximately 30% of the cost of the trip by increasing the 80 minutes of travel so it presents a business opportunity to be explored.

4.2. Factors affecting the competitiveness and development of seaplane transport in Greece

In this section, several SWOT analyses are presented to examine and analyse the internal and external factors of a company and market. Below the respective SWOT aspects of seaplane business in Greece are discussed and summarized in Table 6.

4.2.1 SWOT - Analysis of Strengths

- Speed of trip: Seaplanes can reach a speed of approximately 182 knots such as the Twin Otter Seaplane corresponding to 337 km/h. Although it is not faster than a regular plane, the boarding process can be completed in less time as there is no need to arrive early as it happens at airports. Compared to ferries, seaplanes are significantly faster which usually take several hours to reach their destinations and despite not being necessarily the cheapest transport mode, they can offer convenient and faster transportation than ferries for travelling between islands (Gobbi et al., 2011; Iliopoulou et al., 2015).
- Passenger experience: Seaplane trips allow passengers to enjoy not only the functionality of the trip but also the experience, as flying over the seas and seeing the beautiful landscapes of Greek territory is something that is provided to their customers (Gobbi et al., 2011). This is a factor that can be potentially appealing for tourists, who do not know the territory, but also for the inhabitants. Operating seaplanes on Greek islands through a route network would provide a valuable service as it would shorten distances and would provide an alternative solution to existing modes of transport (Iliopoulou et al., 2015).
- Environmentally friendly: The environmental impacts of seaplanes are low, with almost no environmental impacts. They do not affect maritime and air biodiversity as the propeller of seaplanes is totally above the sea and does not leave sediment as well as the exhaust of the engines which is discharged well above the water surfaces. In terms of noise pollution, the noise level of seaplanes is significantly lower than airplanes and various entertainment and pleasure activities such as speedboats and Jet Skis. These features are favourable for sustainable operations and seaplanes can respond to the need of more sustainable transport vehicles (Luè et al., 2020) especially when there are market segments sensitive to the environmental impact of aviation (Rice et al., 2020).

- Infrastructure requirements: Seaplanes do not have requirements that are too different from those of aircrafts, but they do not require large infrastructures as often port facilities can be employed. A crucial factor for the success of a potential company in this field is the recruitment of seasoned pilots who are also able to transmit safety to their passengers.

4.2.2 SWOT - Analysis of Weaknesses

- Seasonality: Seaplanes are likely to face demand seasonality as summer months are usually busier with peaks of touristic demand (Rigas, 2009). The rest of the year demand depends on residents and business activities and the recurrence of travel will be more limited. In the winter months, the flight schedule will also be shorter as there is earlier nightfall and there are risks of flying at that time impacting on the service schedule (Gobbi et al., 2011; Quilty et al., 2015).
- Costs: Even though the infrastructure required does not need to be extensive, the costs of leasing the seaplanes will be quite high and as such requires a significant initial investment. There are still the costs of maintaining the vehicles that will also have to be covered (Ballis et al., 2018). To begin this kind of business it will be very unlikely that external investment will not be necessary. Economic requirements for sustainable transport is not a new topic as previous works have demonstrated the trade-off between environmental and economic benefits and requirements (Su and Rogers, 2012).
- Circuit: One of the objectives of the strategy established by a company may be the offering of direct trips between points, or indirect trips through circuits. With this second kind of trip, it is also possible to save on travel costs and thus lower prices (Iliopoulou et al., 2015). However, it may not be beneficial to all potential consumers

considering the number of stops that they will have to undergo in the event of using the service.

- Fossil Fuel Seaplanes: As already presented, seaplanes are seen as a cleaner mode of transport than their main competitors and can be considered environmentally friendly. However, they can be even cleaner as soon as electric-powered seaplanes are available (Lou et al., 2019). Nevertheless, despite the existence of projects by start-ups for this transformation it is not yet known when they will be on the market (Arnot, 2019).

4.2.3 SWOT - Analysis of Opportunities

- Natural conditions: Greece is one of the European countries with the greatest potential to render this type of business profitable since it has approximately 150 to 200 inhabited islands, 13,780 km from coastline and over 100 ports. Currently, only 3 waterways are licenced in the ports of Patras, Corfu and Paxos which have already signed the licensing agreements (Tornos News, 2020), but there are several other ports in the process, including 8 in the Ionian Sea and another 33 in the South Aegean region. Its vast maritime territory allied with a large number of islands provides a strong indication of the potential for seaplane operations in this country that has seen annual growth in the Greek Travel & Tourism sector of around 7%.
- Accessibility Issues: Due to the geography and number of islands, Greece requires a developed maritime and air transport that provides good access to its citizens, allowing them to travel between islands as well as between countries (Greek Ministry of Infrastructure and Transport, 2019). While the major Greek islands have access to airports, many of the smallest ones have no airport and the only method of reaching the other islands is by maritime transport (Toskas-Tasios et al., 2019). This mode of transport can exploit the gap by offering an alternative to the ferries of these regions.

- Fleet development: As electric-powered seaplanes are not yet fully developed (Radio Canada International, 2019), they will enable this mode of transport to become more environmentally friendly in the future. Efforts should therefore be made to work alongside such companies and replace the existing fleet as soon as possible.
- Multimodality: One of the aims of the Greek national transport plan relates to problems in the co-ordination of transport between islands and multimodality/interconnectivity between the different modes of transport services (Greek Ministry of Infrastructure and Transport, 2019). Seaplanes can be synergised with the various modes of public transport whether they are direct competitors like ferries and planes or land transport like trains and buses (Ballis et al., 2018).

4.2.4 SWOT - Analysis of Threats

- Fuel volatility: Initially, seaplanes will still have to be used with fossil fuels, making them dependent on the cost of this type of fuel, which is known to be volatile. For at least the next few years, seaplanes used for commercial purposes in Europe will operate with turboprop engines, which use Jet A1 aviation fuel that does not contain some of the most volatile compounds found in many marine engine fuels (Favro et al., 2016; Scandinavian Skies, 2021).
- Bureaucracy and lack of regulation: Over the last 15 years, Greece has experienced several bureaucratic and operational problems. The lack of governmental permits for the legalization of waterways in several regions has delayed the start of operations. Such bureaucracy jeopardizes the risk of investors in projects, since for such reasons similar projects have already failed in Greece. New legislation emerged that may facilitate operations such as the lifting of the daily travel limit for this mode of transport, which made operations more challenging (Paravantes, 2020). Law 4663/2020 contains

relevant information for the operation of maritime airports and also includes measures such as environmental requirements, flight conditions and general provisions. This law complements and amends Law 4568/2018 which had already given some consistency to the projects, thus serving as an important basis for the development of seaplane projects (GTP, 2020). Nevertheless, caution is needed with Greek and European legislation dealing with seaplanes, which is still under development. This transportation mode besides having to deal with aerial standards also needs to meet maritime standards. This versatility is a double-edged sword since there is still a lack of sufficient legislation.

- Lack of European success stories: Unlike in North America, Oceania and the Maldives, there is still a lack of success stories in Europe and this is an indicator that operations at the European level are cumbersome. There is also some concern about the price of seaplanes given that there are cheaper alternatives that may hamper demand. In a survey drawn up in 2011, among several of the seaplane and pilot operators, based on responses only 8% of the operators were located in Europe. Due to the survey's antiquity and lack of progress at the European level, this figure is expected to remain the same or even lower today. Some of the problems at the European level were related to the lack of availability of pilots that were identified as a critical challenge by all European respondents (Mohr & Schömann, 2011). The certification processes had also been highly criticized by operators, who complained that the lack of standard European legislation led to demanding and challenging certification processes , in which EASA should be included.
- Safety: There is a lack of knowledge among the population about this mode of travel, especially in Europe where the use of seaplanes is not so frequent (The Economist,

2019). Although there are some claims that this mode of transport is unsafe, these are not correct as there are few reports of accidents or failures for this type of transport.

- Pandemic: Lastly, COVID-19 should be considered as many people have been having mobility restrictions. Furthermore, we do not yet know the concrete effects of the pandemic on tourism and whether it will affect the country in a meaningful way.

(Please insert Table 6 here)

4.2.5 Dynamic SWOT

After internally assessing both the positive and negative factors of an organisation and the opportunities and threats through external market analysis, a dynamic SWOT was elaborated (Table 7). The development of dynamic SWOT allows positive and negative elements to be combined, reducing threats and minimizing risks through the use of internal capabilities and opportunities provided by the market.

(Please insert Table 7 here)

4.2.6 SWOTi

SWOTi is a tool derived from the original SWOT that allows the designation of an organisation's strengths, weaknesses, opportunities and threats contextualized into three strategic pillars which are defined by the company and are aligned with the already outlined strategy. The three strategic pillars defined in the SWOTi analysis on which a company in this industry should focus are presented in Figure 5 below and are the following: (1) Sustainable development based on the progressive reduction of fossil fuel consumption; (2) Enhancement of the connectivity of isolated regions and their economic growth and; (3) Operations with the maximum consideration for stakeholders ensuring ethical and transparent practices to enhance the environment on which the organization is established.

Some Greek islands and other coastal areas have no airports and the only way to reach them is by ferry or road. Focus on sustainability has to be a crucial component of the organisation's strategy. The organisation should also remain alert to new developments in this transportation sector and pay particular attention to the adoption of electric-powered seaplanes. Therefore, a potential company that wants to introduce itself in this sector must strive to be regarded as an eco-friendly option for the country and handle its different stakeholders, which include employees, consumers and suppliers with the utmost respect and transparency. For all these reasons, after applying SWOTi and the three parameters that constitute it, specifically the strategic pillars, the company's values, as well as the impact that the project may have on Greek society, the actions outlined remain valid as they meet these parameters.

(Please insert Figure 5 here)

4.3. Analysis remarks

One major obstacle to the business is the Greek seaports, which the country has had over the years with several attempts to develop operations, with the complicated operations and the under development legislation. Difficulties in obtaining permits for the planes to land in several of the country's regions and seaports put the economic sustainability of operations at risk. This is a challenge that, despite having been ameliorated in recent years with new measures to encourage the success of operations, remains a risk at present.

Another factor affecting the implementation of this mode of transport is the fear of lack of profitability, as there are cheaper transport alternatives and there are no success stories on the European continent while there is seasonality in the demand night operations have restrictions. Moreover, taking into account the analysis present at the Greek Ministry of Infrastructure and Transport (2019), it is possible to understand that the country still has high potential for improvements in supply of efficient transport.

The islands of the country present challenges at the level of connectivity and social inclusion, with their inhabitants feeling more distant from the people living on the mainland (Iliopoulou et al., 2015). Seaplanes can help to tackle some of these issues and seaplane operations could serve the purpose of reducing these inequalities and enhancing transport operations. There are also issues in the area of multimodality and interconnectivity between the various modes of transport between islands. Hence one of the opportunities in this type of project should be to create synergies. Among these modes of transport with which synergies should be developed are buses, trains, the proximity to major airports and ports. It is also important that the seaplane bases have a parking lot to allow the accommodation of private vehicles.

Taking into account some of these problems and to increase the chances of success for a seaplane operator in the country, core values of a seaplane project should focus on the level of sustainability, enhancement of the connectivity of isolated regions and its economic growth while having maximum consideration in its activities by the various stakeholders.

5. Conclusion

Seaplanes could enhance the connectivity of regions close to water, offer a more sustainable transport mode, alleviate port and airport traffic, stimulate an increase in local tourism, stimulate employment and income for their populations. In Greece, seaplane activities are promising but there is still not a finalized process for the initiation of operations which can face the challenges of high upfront financial investment and significant maintenance costs, resulting in the use of external investors and putting considerable pressure on project managers. Therefore, the strategy to be followed must be detailed.

This study explored the potential of seaplane operations in Greece. A survey was run in Greece for the potential uses of seaplanes and then SWOT analysis were elaborated to

explore the business environment that interested companies could face when entering the seaplane business in Greece and other areas. This study leads to the conclusion that there exists a market for seaplane in Greece ready to be explored. The main challenges, such as the bureaucratic issues, that need to be taken into consideration to ensure success are presented. The lack of government licences for the legalisation of waterways has delayed the initiation of operations of many Greek companies which have already tried to start such operations. The existing bureaucracy jeopardises funds of potential investors that fear that their invested funds will not yield returns. From a user perspective, this study demonstrates that despite the various challenges that such operations must overcome, residents and non-residents (like former tourists) share similar willingness to use this service. The study identified that people would be willing to have the duration of the journey extended in exchange for a price reduction, implying that the price factor is a key component making it important to study whether it makes sense to apply this service taking into account direct routes or through circuits that will have a significantly longer average travel time. The features that were most valued by the survey sample and that should be taken into special account when developing the project, are competitive prices, short travel and waiting times and trip convenience.

Methodologically, the article contemplates several SWOT's from which the business managers can extract useful information about the opportunities and challenges they must face to be able to successfully introduce such business in the country, how weaknesses can be turned into strengths, as well as a SWOTi with three main strategic goals that the company's strategy must always converge on. All these reasons provide this article with implications for Business Managers. Using strategic language, we tried to put into practice the reading that should be made of the external environment. This article also intended to illustrate that the different components of a system cannot be seen isolated, the complexity of the interrelationships of internal and external aspects must be considered in SWOT analysis in order to discuss the

practical applications within the industry under study. The innovation of this article highlights the incorporation of the analysis called SWOTi, or SWOT ISCTE Business School. This tool prepares the map based on strategic pillars with the assumption that the dimensions of the pillars constitute the basis on which the strategy is planned. In addition, SWOTi enables a transversal approach to all strategic paths and works as a "lens" in that through it we can observe the strategy.

The findings of this study are regionally restricted, as there is limited availability of information on the European seaplane market, which is still poorly developed, unlike other continents such as North America where seaplane operations are much more widespread and successful. Future work aims to enlarge the sample of the survey to get more insights of the Greek population and potential visitors. Additionally to that, although Greece as a country meets all the geographical requirements to assure the smooth functioning of these operations many topics also need to be further examined such as the European and Greek norms that must be met, the true operating costs and the fares that must be charged to ensure that travel is cost-effective either for direct flights or route flights and in such cases what are the most appropriate routes to ensure the success of the operations.

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