Factors that impact European tourists' choices on mode of transportation

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Affidavit

I hereby affirm that this Bachelor's Thesis represents my own written work and that I have used no sources and aids other than those indicated. All passages quoted from publications or paraphrased from these sources are properly cited and attributed.

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1 Introduction

Europe has always been the continent with the greatest variety of cultures, languages, and consequently tourist attractions. Since the formation of the European Union, member countries have been increasing gradually. The adaptation to the EU`s laws and regulations was necessary to have economic perks. Removing the visa requirements to travel inside the European Union or EEA(European Economic Area) benefited the economy through tourism. The global tourism industry has been severely impacted by the Covid-19 virus outbreak. The effects of the epidemic in 2020 on the tourist industry have drastically affected both personal income as well as the government's tax revenue. The implemented steps and widespread vaccination of residents facilitated the opening of tourism spots in 2021, contributing long-awaited income to this sector of the economy (Spalević & Stanišić, 2021). There is a lack of information addressing the elements that influence the mode of travel chosen by European tourists regarding the post-Covid era. Considering recent technical developments in renewable energy, virtual reality, etc., it is necessary to gather and evaluate current data on tourism.

Short-term travels to sites beyond one's home or workplace, as well as day trips or excursions, are examples of tourism. Movement for all reasons is included, as well as day trips or excursions(Humphreys & Holloway, J. Christopher, 2020). Academic literature of various organizations has explored a variety of methods for defining tourism. Both the supply and demand sides of tourism have been considered in the definition of the industry, and conceptual as well as technological techniques have been used to do so. Although there are theoretical supply-side definitions of tourism, the complex and dispersed structure of tourism makes it difficult to describe and so assess Cooper(2012). There are a number of businesses that make up tourism, but the extent to which these industries serve tourists or other customers varies tremendously. For example, transportation, lodging, catering services, leisure, and travel commerce in the words of Sven Gross(2014: 14).

Major European capital cities have invested a substantial amount of capital in these industries. Public touristic attractions were renovated and made accessible to the public to enjoy for free or for a minor fee supporting the ongoing investment. On the other hand, private businesses have seized this opportunity to supply food, leisure activities, and transportation platforms mainly targeting tourists. Since these investments contribute greatly to the economy of European countries there is a continual desire to improve tourist attraction and provide more efficiently the goods and services that are dependent on this industry to the consumers.

To move anything (people or things) from one location to another, you use the term "transport" or "transportation." Transportation infrastructure is comprised of physical features such as routes (e.g., roads, rails, etc.), methods (e.g., vehicles), handling facilities (e.g., bus, railway, or airline facilities), and transfer facilities (Sven Gross, 2014).
Transport modes may be categorized in three ways, according to traditional definitions in the business management literature: Sea, air, and ground transportation are all modes of transportation. Type of transport refers to the actual method of movement implemented inside a given mode. There are several ways to classify cruise tourism, such as low-cost airlines and charter carriers as well as maritime modes of transportation (Duval, 2007).

Transportation is an essential aspect of the travel experience. A flight on a leisure airline, for example, or even travel inside the location (such as an itinerant excursion by local bus) might serve a functional purpose, but it can also play an important part in the vacation itself. The transportation form can play a variety of roles, from being a major tourist destination to being part of an outdoor experience (such as biking, hiking, or hot-air ballooning), to providing the essential elements of the tourism industry (such as in a cruise vacation or traveling along (scenic and/or historic) On the subject of tourist transit experiences the importance of intrinsic value. Traveling by cab, urban transportation, or metro is mostly underrated, but going on a walking or cycling

vacation, or a historic train vacation, is highly pleasant on the tourist transportation methods. As a means a goal in tourism, where the amount of happiness is directly proportional to travel costs and speed, transportation has no inherent value in itself(Sven Gross, 2014).
There are a variety of aspects that influence the tourist transportation choice:

- the existence of precise modes of transportation.
- the cost-effectiveness of using various modes.
- the intention for journeys, which is a major determinant for the economic viability of creating new routes and infrastructures or improving current ones.
- the time budgets regarding potential tourists of these networks(Duval, 2007).

Tourism has undoubtedly suffered in recent years because of the COVID-19 pandemic-related restrictions. Alternatively, the situation is steadily improving as individuals express an interest in visiting further destinations and sharing their travel experiences. The goal of this thesis is to provide a more in-depth analysis of the tourist business in Europe's main capital cities. Vienna, Rome, Barcelona, Amsterdam, and Paris are Europe's most visited cities and will be the subject of this study. Taking the elements into consideration, five variables influence consumer behavior when it comes to selecting a mode of transportation for tourist reasons. These considerations include the following:

1. transportation expense
2. the duration of the transport
3. the risk or degree of safety associated with the form of transportation
4. transportation accessibility
5. the environmental sensitivity factor in transportation.

The research will examine the link between these variables and the customers' choice of tourist transportation. Additionally, environmental consciousness will be studied as a factor in and of itself, as well as in connection to the other components.

RQ1: How does cost impact European citizens' choices on the mode of transportation?

RQ2: How does safety affect European citizens' choices on the mode of transportation?

RQ3: How does time impact European citizens' choices on the mode of transportation?

RQ4: How does accessibility impact European citizens' choices on the mode of transportation?

RQ5: How does carbon footprint affect European citizens' choices on the mode of transportation?

RQ6: What effect does environmental awareness have on the relationship between the factors and European citizens' choice of transport?

2 Literature Review

2.1 Tourism Transportation costs

In terms of economic activity, tourism has a very elastic demand curve(Konovalova et al., 2013). As the cost of international transport is so high, price changes have a huge impact on demand. As a result, tourism relies heavily on transportation. International and even national transportation infrastructures are under pressure to convey enormous numbers of people in an efficient, quick, and cheap way(Rodrigue, 2020). That is the reason why Local governments in Europe may have to spend a lot of money on infrastructure development for tourism facilities such as: roads, airports, railway stations, etc. (Barcelona Field Studies Centre, 2019). It requires significant financial outlay as well as intricate planning. Due to the rapid growth of the tourism sector, well-organized terminals and well-planned timetables must be in place to ensure that visitors have appropriate transit options(Rodrigue,2020).

Tourist transportation purpose categories will display a distinct set of features depending on the goal of the tourist's trip. This results in common categories such as "business tourism," "sports tourism," and "medical tourism," which is defined as foreign travel with the intent of accessing medical treatment(Walton, 2018). Considering the differences between business and pleasure travel, for example. The business traveler will have very little control over the destination or the time of the journey. Even when a long journey is required, business excursions sometimes have to be planned on an urgent basis. As a result of these considerations, business travelers require frequent, regular transportation as well as expedient service and high-quality lodging and dining options at their destination(J Christopher Holloway & Humphreys, 2020). Individuals that travel for business purposes are not affected by price fluctuations at almost any level as their employer mainly contributes to their trip. This means that business travel is generally inelastic when it comes to pricing(Litman, 2019).

Price has a significant impact on consumer behavior in a competitive market of commodities, goods, types, customers, ethnicities, and preferences. These factors of marketing must be studied if we are to learn how product price affects the purchasing behavior of customers of various races, ages, and genders(Zhao et al., 2021). Many elements, both external and internal, play a role in shaping visitors' transport mode choices. The expense of transportation is considered an internal factor(Collins & Potoglou, 2019). According to (Zhao et al., 2021) consumers are influenced by pricing since the more expensive a product costs, the fewer units it sells. Products offered for less than the standard rate, on the other hand, are considered to sell in greater quantities. Customers are more likely to purchase something if they think the price is reasonable.

2.1.1 Rail-Road Transport cost

The railroad was the primary mode of passenger transportation until automobiles became the norm. In terms of travel, the railway network is more likely to represent the economic demands of a country's economy than the tourist traffic, which might make it less popular. Several nations, particularly in Europe, have invested heavily in long-distance and high-speed rail infrastructure(Rodrigue, 2020).

According to (*Rail Europe - Rail Travel Planner Europe - Train Travel in Europe (Eurostar – TGV – Eurail – Eurorail)*, 2018) the most affordable prices set for a one-way trip for an adult one week before departure, on 22.04.2022 are:

- Vienna - Rome (99€)
- Rome- Barcelona (255.60€ including changes)
- Barcelona - Paris (179.20€)
- Paris - Amsterdam (135€)
- Amsterdam - Vienna (99€)

Rail transportation may be a tourist attraction in and of itself because of the landscape or facilities it offers. Some abandoned rail lines have been transformed into tourist attractions(Rodrigue, 2020).

2.1.2 Air Transport cost

International travel often necessitates long-distance travel, and air travel is the most common means of transportation. International aviation traffic increase is closely linked to international tourist growth. Summer is the prime season for air travel, which has a noticeable seasonality due to tourism(Rodrigue, 2020).

According to (*Skyscanner | Find the Cheapest Flights Fast: Save Time, Save Money*, n.d.) the most affordable prices set for a one-way trip for an adult one week before departure, on 22.04.2022 are:

- Vienna - Rome (45€)
- Rome- Barcelona (144€)
- Barcelona - Paris (43€)
- Paris - Amsterdam (77€)
- Amsterdam - Vienna (166€)

The airline sector has pricing power during peak tourist demand because of this seasonality and the expensive expense of purchasing new assets to fulfill peak demand. Because there may be unmet demand for seasonal charter services, they take advantage of this opportunity. While charterers go to the Caribbean and Mexico in the winter, the European market is more popular in the summer(Rodrigue, 2020).

2.1.3 Maritime Transport costs

The majority of cruises are short marine voyages lasting less than a week. In recent years, the cruise business has grown significantly. Passengers aboard cruise ships may make use of the services and entertainment offered on board while traveling between ports of call. In 2015, there were around 22.2 million

foreign cruise travelers, representing an annual increase rate of almost 7 percent since 1990(Rodrigue, 2020).

According to (*Western Mediterranean Cruise with Nautica on 23/04/2022 (Single Cabin) - 12 Days*, n.d.) the lowest possible price set for a 12-day length trip for two adults, accessed on 15.04.2022 is 2569€. The following timetables for the trip are stated:

1. Sat. 23/04/22 (Lisbon / Portugal)
2. Sun. 24/04/22 (At Sea)
3. Mon-Tue. 25/04/22 - 26/04.2022 (Sevilla / Spain)
4. Wed. 27/04/22 (Gibraltar)
5. Thu. 28/04/22 (Malaga / Spain)
6. Fri. 29/04/22 (Cartagena / Spain)
7. Sat. 30/04/22 (Palma de Majorca / Spain)
8. Sun. 01/05/22 (Barcelona / Spain)
9. Mon. 02/05/22 (Marseilles / France)
10. Tue. 03/05/22 (Monte Carlo / Monaco)
11. Wed. 04/05/22 (Livorno / Italy)
12. Thu. 05/05/22 (Rome / Italy)

The price per day, for two adults, would be calculated accordingly: The total price / The number of days traveling. 2569€ / 12days = approx. 214 euros per day. Every meal and soft drink are included during cruising periods as well as entertainment and activities provided by the staff on board.

The income generated by a cruise ship visitor is much lower than the money generated by a tourist who travels by plane. In part, this is since cruise companies want to keep as much of the cost of tourism on board their ships as possible (food, drinks, entertainment, shopping). Tourists that arrive by plane tend to remain in the same place for a few days and take use of the local facilities(Rodrigue, 2020).

2.1.4 Automobile Transportation Cost

Most people who travel by car do it on their own cost, choosing the route and duration of their journey. Since road costs aren't paid directly by the user, this option tends to be more affordable. It is the only method of transportation that allows you to complete your trip from start to finish without having to change modes. Some of the most popular tourist destinations may be found along major highway corridors, where service operations such as restaurants, petrol stations, and hotels have consolidated(Rodrigue, 2020). However, not all viable routes are available as there are routes that require payment to pass, and as a result, arrive quicker at the preferred destination.

This implies that drivers that use a certain route or travel in a specific region are charged a fee. It is called congestion pricing, or decongestion pricing when tolls are greater during peak times than at other times(Litman, 2019).

Travel by car is the most popular form of transportation worldwide, accounting for 77% of all trips. This is mostly due to factors like convenience, affordability, and freedom. Car rental firms have sprung up around major transportation hubs (airports, railway stations) and tourist attractions since tourists often hire vehicles to go about their locations(Rodrigue, 2020). In addition, as stated by(Litman, 2019) low fuel prices, roads, and parking encourage people to use cars, which leads to more people relying on automobiles, which increases the burden on the economy, society, and the environment in countries that embrace these policies early on.

H1: The cost of transport affects the tourist's choice of mode of transport.

2.2 Safety

Safety and security have long been recognized as essential factors in the selection of destinations by travelers. Tourists' perception of danger is more

relevant than the real or absolute safety of a place. As a result, visitors are more concerned with their safety than with the safety of others(Jensen & Svendsen, 2016). According to (Yang & Nair, 2014) humans are born with a fundamental desire for safety, according to the classic work of. Tourists prefer to steer clear of places with a reputation for danger, as shown by a large body of research. However, the purchase of a vacation is a risk since tourist travel is intangible, indivisible, diverse, and temporary in nature.

2.2.1 Rail-road transport safety

According to(Ouedraogo et al., 2018) railway network reliability remains a key issue, since accidents may inflict severe infrastructure, ecological harm, and numerous deaths (e.g., railway accidents of summer 2013 in France, Spain, and Switzerland). Petty theft, pickpocketing, and drug peddling are just some of the ways that railroads and their terminals are threatened by criminals. Safety concerns revolve around the evacuation of railway trains and terminals in the event of an emergency. For the subway system, the same issues about protection and well-being remain valid Because they tend to be located in densely populated areas, and railroad stations tend to have a strong connection to the local community(World Tourism Organization (Madrid, 1996).

However, the safest trains in the world are in Europe. To provide a consistent approach to rail safety throughout the European Union, EU law provides the framework. For a train business to operate on the European network, it must get a safety license from the European Union. Additional requirements include establishing national railway safety agencies and autonomous investigations entities inside European Union Countries (Rail Safety, n.d.). In many countries, the stations have all become locations where people can connect, shop, and travel. Cities, railroads, and tourist organizations must work together closely to ensure that train stations are attractive places to visit and that passengers have a pleasant experience. When train and subway stations get this type of care, earnings soar, and crime and security concerns diminish(World Tourism Organization (Madrid, 1996).

2.2.2 Air transport safety

Despite the abundance of data on safety, it remains a tough topic to evaluate. Regarding road or rail transportation, the danger increases with the number of travelers. Although, in the case of air travel arrival and departure accidents account for a large percentage of all incidents(Peeters et al., 2004). Traveling by air transport is among the safest options available. Everyone in the European Union has access to the greatest degree of air safety. The European Union's approach to air security management relies on the monitoring and reporting of incidents(*Aviation Safety Policy in Europe*, n.d.)

However, even for modes of ground transportation like automobiles, variables other than the amount of traffic have a significant impact on safety. Main dual carriage highways are often safer than single carriage roads per vehicle kilometer. Additionally, the speed at which a vehicle travels and the road's precise design are key factors (Peeters et al., 2004).

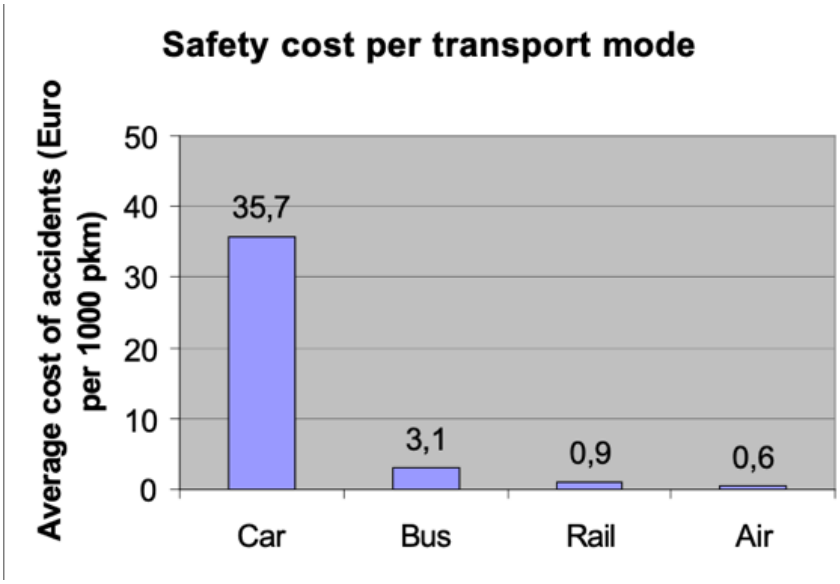


Figure 2. The average cost of accidents per transport mode 1995.

Figure 2 displays the cost per kilometer of accidents in 1995. The cost of accidents related to car transportation has the highest value, followed by bus transportation, rail transportation, and air transportation. Transportation modes such as buses, trains, and the air had far lower accident rates than private automobiles. To conclude, (Peeters et al., 2004) states that 97% of tourists used cars, 1% used buses, 1% used flights, and 0.2 percent used trains in their journeys, indicating a lopsided balance in favor of automobile travel in the tourism industry.

2.2.3 Maritime Transport Safety

The terrorist attacks of September 11, 2001, in the U.S., consequence in compiling a comprehensive list of rules and regulations governing the security and safety of ships and port infrastructure. The increasing size of cruise ships as well as the constant danger of terrorist activity render cruise ships a potential target. The result was an increase in the security measures in place for travelers and personnel(Butler et al., 2010).

According to the European Union's Official Journal on 30 November 2017, a series of regulatory measures which consolidate and strengthen the uniform regulations on maritime safety in EU waterways were presented. European Parliament approved them on 04.10.2017 and the Council on 23.10.2017 respectively. Immediately upon publication, the new regulations became effective A proposal by the European Council to harmonize safety regulations for light cruise liners with a maximum length of 24 meters was accepted on 09.04.2019. European Union member states have established their first safety guideline for all small passenger ships(Safety of Passenger Ships, n.d.).

2.2.4 Automobile Transport Safety

Preliminary data on road deaths for 2021 was released by the European Commission. A considerable number of 19,800 individuals lost their lives in automobile accidents. Automobile road transport safety is highly affected by individuals' characteristics and behavior.

For example, a few studies have looked at other demographics who are similarly thought to be at hazard of traffic accidents. Licensees with a bad driving record (previous accidents and/or offenses) or inexperienced young drivers are good examples. When it comes to risk-taking and euphoric feeling behaviors, beginner young employees are more inclined to participate than more experienced drivers (Gamero et al., 2018).

On the other hand, this shows a decrease of over 3 000 (-13 percent) casualties from 2019, before the pandemic. According to(Directorate-General for Mobility and Transport, 2022) the ultimate goal is to reduce mortality by half by 2030. There was a 36% decrease in accidents in Europe in the last ten years.

H2: The safety of transport influences the tourist's choice of mode of transport.

2.3 Accessibility

The most important purpose of basic tourist transportation is accessibility. Tourists may choose from a variety of forms of transportation in order to get to their desired locations(Rodrigue, 2020). However, the cost of planning and constructing a "perfect" combination of routes and limitless intersections of transport modes available is exorbitant. There is a trade-off between the

objective of connecting as many areas as possible and the limits of price and infrastructural developments.

It is more practical to think of a region's geographical structure in terms of a network of sub-networks, each of which represents a particular economic relationship. Although, the cost may be referred to as the determinant factor regarding the accessibility of transportation modes, (Rodrigue, 2020) states that several factors go into creating networks, such as giving access and mobility, strengthening certain corridors, or technical advancements that make a particular mode and its infrastructure more favorable than the competition.

Route accessibility is considered an internal factor that influences visitors' transportation mode preferences(Collins & Potoglou, 2019). Studies on geographic accessibility, which often focus on the distance to the closest service, tend to overlook the availability of options. According to (Haynes et al., 2003) most proponents of the prospective accessibility measure like the quality of transport service and amount of availability at each place must influence the decision of a transport.

2.3.1 Railroad Transport accessibility

There are now more than 20 separate national railway control and command systems in use throughout Europe (European Rail Traffic Management System, n.d.).

As high-speed rail (HSR) became more widely used throughout Europe during the 1980s, it became more complex to operate. With the addition of these initial lines connecting large metropolitan areas to whole HSR networks, including multiple regions, the range of possible links has increased dramatically. In contrast, new HSR services and commercial methods such as decreased ticket prices are creating a whole new environment in which the HSR infrastructure may serve multiple roles in passengers' transport alternatives (Moyano et al., 2019). The European Railway Traffic Management System (ERTMS) is

designed to replace them all. Interoperability between trains across borders will be improved as a result of the system's implementation (European Rail Traffic Management System, n.d.).

However, the modernization of Europe's railway infrastructure has already begun as Europe's major railway companies have introduced new business practices focused on the tourism industry to effectively engage with other modes of transportation (Moyano et al., 2019). OuiGo in France has improved its HSR, and the new service utilizes locomotive-powered trains that travel at a maximum speed of 160 kilometers per hour. Paris to Nantes by OTC takes between 3h30 and 4h15 compared to the TGV's two-hour non-stop service. Angers and Juvisy are accessible by the trains, which go between, Les Aubrais, Blois, Saint Pierre-des-Corps, and Saumur(Haydock, 2022).

This has increased demand for HSR, yet there is limited evidence that HSR can assist in promoting tourism development. A positive impact on tourism development from HSR will be difficult to achieve without significant local commercialization of the tourist destination and its newly improved accessibility. However, (Moyano et al., 2019) state that traveling to a well-known tourist destination like Paris or Madrid, the outcome is rather diverse. Consequently, high-speed rail has a huge impact on the travel plans of tourists.

2.3.2 Air Transport accessibility

Increases in air passenger transport have been linked to increased regional development in Europe, with favorable outcomes for job creation and tourism, according to economics literature(Calzada & Fageda, 2018).

During the 1992-1997 period of European air transport liberalization, preexisting restrictions on where airlines may travel, and costs were eased. As a result of the execution of the "third package" of liberalization measures and

the rapid rise of 'low-cost airlines,' Europe saw a tremendous increase in air travel in the late 1990s(Mason et al.,2013). Consumer travel habits and corporate spatial patterns were modified as a result of the social and economic integration of European nations, which spurred the development of new routes(Calzada & Fageda, 2018).

Airlines compete with one another for customers, which means airports must evaluate which flights are most beneficial for the airlines themselves. Also, airlines are eager to know which paths will create the most traffic and consequently profitability. They alter their offer based on competition, the rise in demand, and the structure of regional restrictions. Moreover, governments are keen to explore the market qualities that attract airlines, and they may utilize public service duties, and public assistance to improve airport connections. (Calzada & Fageda, 2018).

2.3.3 Maritime Transport accessibility

A significant increase in cruise passengers throughout the globe and a significant increase in the capacity of cruise ships have been seen in recent years. From 2000 to 2016, the number of global travelers expanded by an average of 7.3 percent each year, whereas the marine ship capacity, increased by an average of 5.3 percent per year. The use of cruise ships incorporates features of both tourism and marine commerce. As the cruise industry expands, so does the number of ports that accommodate cruise ships, and this trend is expected to continue. The majority of time, this entails the construction of new cruise facilities alongside existing port docks(Esteve-Perez et al., 2019).

In terms of geographic scale, cruise traffic mostly utilizes the sea on medium and large dimensions, respectively. Itineraries for exploring a new area are often planned aboard a medium-sized ship. For example, a medium-scale itinerary includes the ports of Barcelona, Marseille, Genoa, Naples, Messina, Valletta, and Barcelona. It takes eight days to complete the 1,756-nautical-mile round(Esteve-Perez et al., 2019). The accessibility of cruises was presented in the previous paragraphs. The 12-day cruise trip route enabled tourists to join

and visit ports and cities in Europe such as Lisbon(Portugal), Sevilla(Spain), Gibraltar, Malaga(Spain), Cartagena(Spain), Barcelona(Spain), Monte Carlo(Monaco), Livorno(Italy), etc. (*Western Mediterranean Cruise with Nautica on 23/04/2022 (Single Cabin) - 12 Days*, n.d.).

2.3.4 Road Transport accessibility

As part of the transportation network, roads are ranked according to their importance to the overall system. One level above all other roads, freeways (highways) are single-lane, no-intersection thoroughfares that serve a limited number of people. The primary advantage of automobile road transportation is the flexibility the individual has during the travel to his destination. A vast number of interchanges were created to link crossing roads, resulting in a range of interchange designs to reduce traffic flow. The roads that have signals at intersections are supplied by collectors and local roads, which are primarily intended to link specialized activities (residences, retail stores, and industries).

World Main Road Network

Figure 1.

As presented by(Rodrigue, 2020) European countries such as Italy, Germany, and France have more than 150 km of road per 100sqr.km. These countries are ranked after Japan and the United Kingdom and exhibit complex road infrastructure. The wide range of road networks in the capital cities of Europe provides more than enough accessibility for every tourist to travel to his destination of choice.

H3: The accessibility of transport affects the tourist's choice of mode of transport.

2.4 Time

Numerous definitions of tourism emphasize the importance of time. Tourism may be seen as a kind of leisure travel rather than business travel. Tourism may involve the hours worked, the amount of vacation time available, and the intervals between days off from work. Historically, these factors have influenced the possibility of travel. The place visited represents several forms of movements (for example, modes of transportation) and times (such as speeds and rhythms). Traveling in a certain mode or method affects the patterns that generate a sense of place. Additionally, vacationers seek distinct seasons throughout the year. Individuals are constant in their willingness to travel for a certain period of time. After a given distance, tourist numbers tend to drop(Dickinson & Peeters, 2012).

Automobile and airplane transportation proponents often emphasize the importance of time restrictions in their arguments. While the stance has some value, it also functions as a roadblock to comprehension. The increasing speed of train travel on a global scale is an excellent instance. According to(Dickinson & Peeters, 2012)., travelers exaggerate their estimates of trip times for modes of transportation other than air. Numerous elements influence one's perception of travel time, including the journey's geographic location, the cost of the journey, the ease or complexity of the route, as well as the purpose of the trip (business or pleasure).

Visitors' transportation mode selections are influenced by a variety of factors, both external and internal. External factors include the amount of time required to travel(Collins & Potoglou, 2019). People were 29 percent less likely to purchase a service for every extra minute of journey time. Results were found to be in line with the combination of residents' travel time to the closest operation and the variety of options available to their behavior(Haynes et al., 2003).

H4: The time duration of the trip affects the tourist's choice of mode of transport.

2.5 Carbon Footprint

Greenhouse gas emissions from an item may be estimated using the carbon fo otprint. This

can be reduced by making environmentally friendly decisions(Penz et al., 2019). Studies on the ecological implications of tourist transportation primarily focus on the influence of the tourist attraction and ignore the environmental consequences generated by tourism transportation to the attractions, which substantially limits a clear understanding of the relationship between tourism and the environment. (Peeters et al., 2007). The CO2 emissions from combustion in the transport sector accounted for more than 27% of total Eurozone emissions of carbon dioxide in 2014, according to data from the International Energy Agency (IAEA). Almost all of the transportation sector's CO2 emissions come from automobiles, making it the biggest source of carbon. Concerningly, since 1990, co2 Emissions have decreased but road transport CO2 emissions have grown by 15 percent in 1990 and 18 percent in 2014(Marrero et al., 2021).

Notably, in air transport, the Covid-19 outbreak in 2020 has reduced transportation emissions significantly. In 2020, international airline carbon footprints were 54% lower than in 2019. Pandemic-related emissions reductions are expected to be short-lived. Air traffic volume is forecast to increase from 2021, and flight numbers are likely to revert to 2019 values by 2024(Greenhouse Gas Emissions from Transport in Europe, 2021).

However, according to (Weber et al., 2022), transport emissions are expected to fall by 90% by 2050 as part of the EU's plan to become carbon neutral. More than half of the world's demand for fossil fuels is met by the transportation industry alone, which emits roughly 24% of global carbon dioxide (CO2) emissions. The Vienna Institute for International Economic Studies (wiiw)

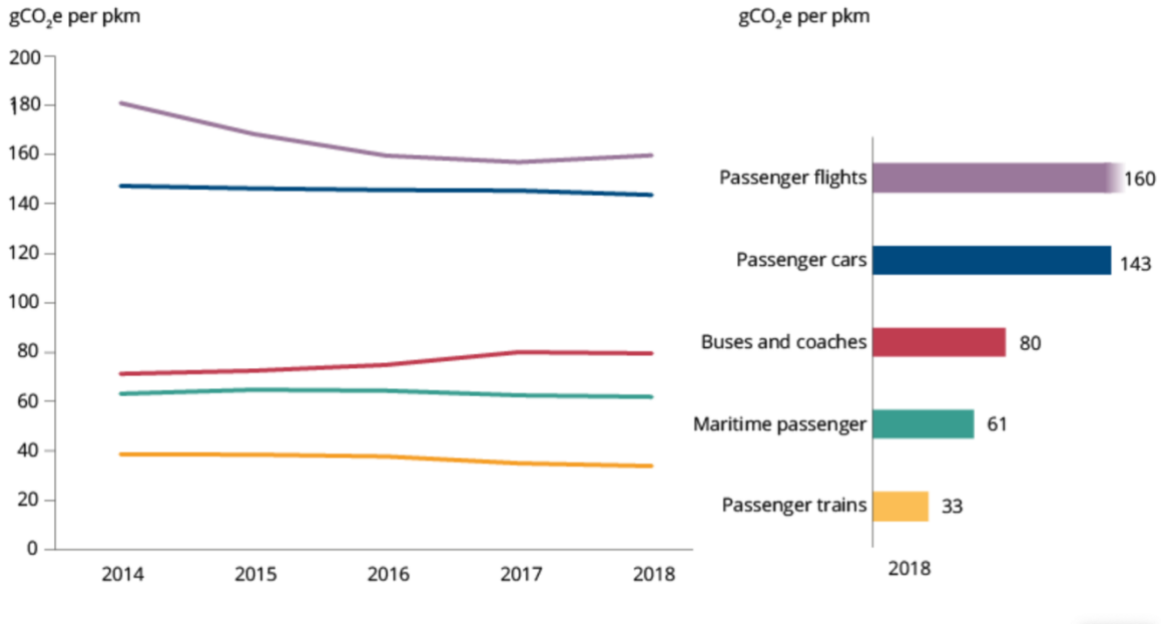
produced a paper in 2018 advocating the development of a European Silk Road, which included a proposal for an HSR network along the projected corridors

The emission parameters used to operate various forms of transportation are very similar across studies and the literature. For every passenger kilometer, trains emit the least CO2 (as measured in kilograms of CO2 per passenger kilometer in Europe). With an emission rate of 0.126 kgCO2 /km, flying creates 4.5 times as many pollutants per passenger kilometer as driving. Cars carrying passengers on the roadway produce 0.132 kgCO2/km. As a result, 0.099 kgCO2 /km can be eliminated for every passenger transferring from aircraft to rail, and 0.105 kgCO2 /km can be averted for each customer transferring from the roadway to the railway (Weber et al., 2022).

Nowadays, sustainable options available to consumers have proliferated, making it more difficult to choose based on the abundance of information and marketing. Individual and societal environmental concerns need behavioral change, and experts believe that mechanisms to improve sustainable choices are required. Generally, consumers are not well-informed about how their purchasing decisions affect these outcomes(Penz et al., 2019).

Mode of transport	CO_2 per PKM	
	2016	2030
Car	0.1135	0.0752
Bus	0.0300	0.0244
Rail	0.0205	0.0188
Air	0.1042	0.0798
All modes	**0.0930**	**0.0680**

(World Tourism Organization and International Transport Forum, 2019)



(*Rail and Waterborne — Best for Low-Carbon Motorised Transport — European Environment Agency*, 2021)

Unfortunately, the air transport emits 160g/pkm and has the highest produce of gases. Automobile transport has a noticeable effect on CO2 emissions, in which personal vehicles produced mean Greenhouse gases of 143 g/passenger-kilometer (km), public buses produced 80 g/pkm, and maritime transportation generated just 61 grams (g/pkm) of GHG emissions (*Rail and Waterborne — Best for Low-Carbon Motorised Transport — European Environment Agency*, 2021)

H5: The carbon footprint of transport affects the tourist's choice of mode of transport.

2.6 Environmental Consciousness

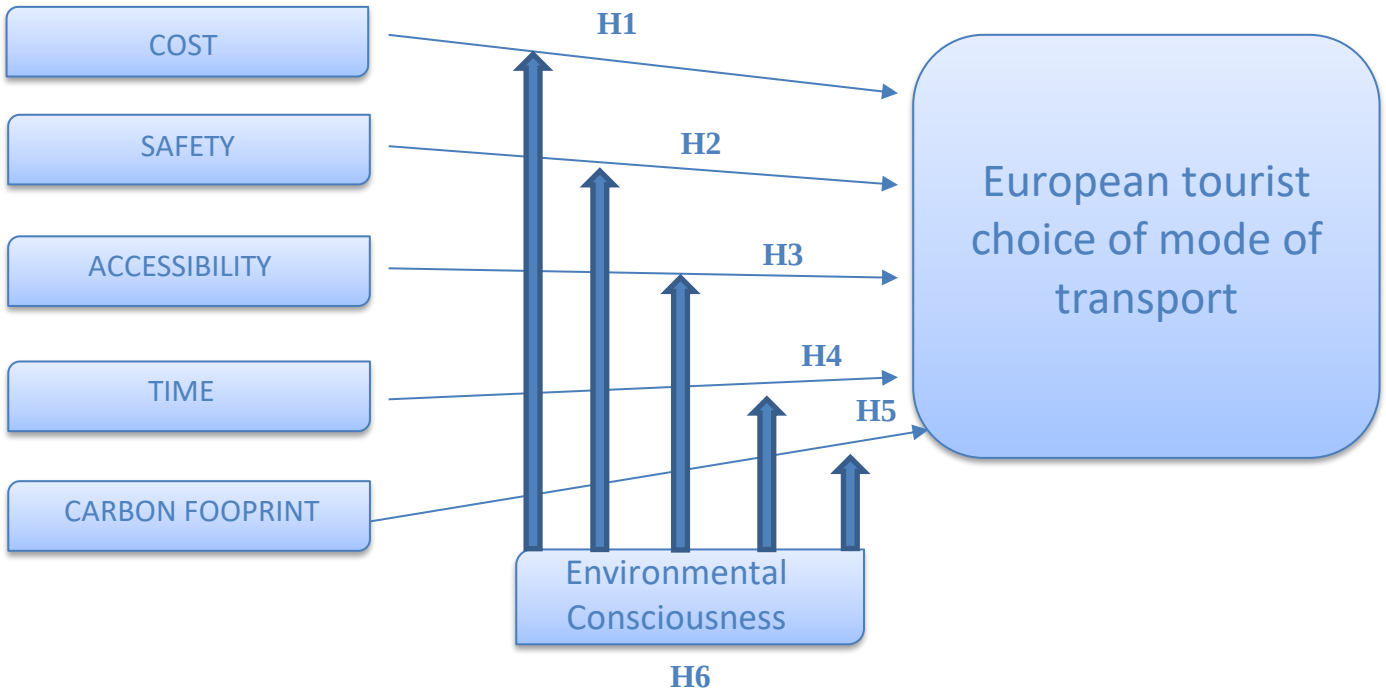
The location, type of vacation, housing, travel agency and duration, and travel dates are all interconnected and influenced by one another. Individuals' core wants and objectives, such as self-improvement, safety, and social connection, all influence these decisions (Kamb et al., 2020).

The importance of price, length, and accessibility when deciding on a method of travel, noting that time had significant influence for train trips extending over five hours. Social customs and individual traits such as environmental awareness, vehicle ownership, age, profession, occupation, and financial resources are also significant considerations. When respondents were asked to rank different factors, sustainability concerns came in last. When choosing a mode of transportation, cost and trip time are believed to be more important than environmental concerns (Kamb et al., 2020).

While these results may seem disheartening, current research demonstrates that the provision of superior alternatives such as HSR is critical for influencing visitor transportation behavior and reducing flying volume. Rather than being denied the option to travel, persons who select other modes of transportation have a somewhat different experience. Nonetheless, actions targeted at enhancing traffic safety, such as speed limit reductions, may influence pollution emissions as well. Because environmental and safety standards are inextricably linked, it is important to conduct a joint assessment (Wang, 2019). Additionally, it is underlined that to significantly decrease air travel, it is important to influence societal norms and establish effective regulatory measures. 2020 (Kamb et al.)

H6: Environmental awareness influences the relationship between the factors and European citizens' choice of transport.

2.7 Research model



3 Methodology

3.1 Study design

A critical component of this bachelor thesis is the selection of a research plan that will govern the collection of raw data. The whole study group is considered the population. If the population is large or small, it doesn't matter as long as each member in the group being examined is included. A representative sample is picked from the population since a census (which would include everyone in it) is impracticable due to the ongoing turnover and resource restrictions. Samples that are statistically identical to the population may be inferred from population data if they are selected correctly(Zikmund,2001). The quantitative method, which is concerned with the link between quantifiable elements in order to evaluate objective explanations is conducted as experiments or surveys(Creswell, 2014).

The experiment will be conducted as an online survey with a sample size of 100 to 150 individuals (European citizens). A semantic differential scale and Likert scale will be used in the questions measuring each person's opinion. Social media will be used to promote the survey and a discount code or reward form would be provided to provoke a reaction. The survey will be conducted in Google form for simplicity and questions will be available for data collection for a period of two weeks. After 14 days the data will be collected, cleaned, and ready for statistical analysis.

3.2 Measurement item table

The European citizens would have to answer a survey regarding vehicle cost, safety, accessibility, time, and carbon footprint as well as their preferred mode of transport for future travels as the second construct for each of the variables mentioned.

Construct / Variable	Measurement Item	Source
Cost	For each mode of transportation, please indicate your perception of cost.	(Hayes et al., 1998)
Safety	For each mode of transportation, please indicate your opinion on their safety level.	(Hayes et al., 1998)
Accessibility	For each mode of transportation, please indicate how accessible they are to you.	(Hayes et al., 1998)
Time	Please indicate how time-consuming you find each mode of transportation.	(Hayes et al., 1998)
Carbon Footprint	For each mode of transportation, please indicate your opinion on their carbon footprint.	(Hayes et al., 1998)
Environmental Consciousness	1. It is important to me that the transport modes I use do not harm the environment. 2. I would describe myself as environmentally responsible. 3. My travel habits are affected by my concern for the environment.	(Strizhakova et al., 2021)
Choice of Transport	Indicate how likely you are to use each mode of transport mentioned below: • Railroad. • Maritime. • Air transport. • Automobile.	(MADHUWANTHI et al., 2016)

4 Analysis

4.1 Descriptives

Exactly 130 European citizens/tourists answered the survey. After cleaning the data, the number of respondents was reduced to 128. The descriptives table above presents the min. and max., the mean and median as well the values of skewness and standard deviation of all the answers. The air transportation method is perceived to be quicker, more accessible, and less eco-friendly, while statistics convey Ship/Cruise transport to be the most expensive considering the aforementioned transport modes. The Shapiro-Wilk normality test was performed to conclude the distribution of the data. The data set is not normally distributed as the p-values of all the variables are smaller than 0.05. Based on these results, the Spearman correlation statistical analysis will be conducted to verify the hypotheses.

Descriptives

				Skewness		Shapiro-Wilk	
	N	Mean	Median	Skewness	SE	W	p
Railroad transport cost perception	128	5.91	6.00	0.2855	0.214	0.930	< .001
Air transport cost perception	128	7.47	7.00	-0.3416	0.214	0.910	< .001
Ship/Cruise transport cost perception	128	7.41	8.50	-0.8341	0.214	0.859	< .001
Coach / Bus transport cost perception	128	3.46	3.00	1.1950	0.214	0.881	< .001

Descriptives

				Skewness		Shapiro-Wilk	
	N	Mean	Median	Skewness	SE	W	p
Railroad transport safety perception	128	6.67	7.00	-0.4208	0.214	0.949	< .001
Air transport safety perception	128	6.78	7.00	-0.4700	0.214	0.922	< .001
Ship / Cruise transport safety perception	128	5.20	5.00	0.0735	0.214	0.943	< .001
Coach / Bus transport safety perception	128	5.30	5.00	0.1182	0.214	0.931	< .001
Railroad transport accessibility perception	127	6.13	6	-0.3309	0.215	0.939	< .001
Air transport accessibility perception	128	6.42	7.00	-0.2660	0.214	0.930	< .001
Ship / Cruise transport accessibility perception	128	4.73	4.00	0.1451	0.214	0.942	< .001
Coach / Bus transport accessibility perception	128	6.37	7.00	-0.5043	0.214	0.922	< .001
Railroad transport time perception	128	7.05	7.00	-1.4040	0.214	0.861	< .001
Air transport time perception	128	8.23	9.00	-1.9057	0.214	0.731	< .001
Coach / Bus transport time perception	128	4.22	4.00	0.8048	0.214	0.922	< .001
Cruise / Ship transport time perception	128	5.58	6.00	-0.2249	0.214	0.959	< .001
Railroad transport carbon footprint perception	128	3.38	3.00	0.8114	0.214	0.877	< .001
Air transport carbon footprint perception	128	6.76	7.00	0.1503	0.214	0.942	< .001
Ship / Cruise transport carbon footprint perception	128	7.09	7.00	-0.4795	0.214	0.929	< .001

Descriptives

				Skewness		Shapiro-Wilk	
	N	Mean	Median	Skewness	SE	W	p
Coach / Bus transport carbon footprint perception	128	6.02	6.00	0.6429	0.214	0.925	< .001
I would describe myself as environmentally responsible.	128	6.10	6.00	-0.0298	0.214	0.945	< .001
My travel habits are affected by my concern for the environment.	128	5.57	6.00	-0.2449	0.214	0.955	< .001
It is important to me that the transport modes I use do not har	128	5.68	5.00	0.3364	0.214	0.936	< .001
Railroad transport - choice of travel	128	6.42	7.00	-0.5705	0.214	0.939	< .001
Air transport - choice of travel	128	7.45	8.00	-0.6223	0.214	0.898	< .001
Ship / Cruise - choice of travel	128	4.09	4.00	0.6124	0.214	0.907	< .001
Coach / Bus transport - choice of travel	128	3.88	3.00	0.5386	0.214	0.892	< .001

H1: The cost of transport affects the tourist's choice of mode of transport.

The first hypothesis predicts a relationship between the cost/price that the consumer must pay in order to travel and the chosen mode of travel. The correlational analysis conducted on the data set presents no significant values that could verify the relationship between cost and choice of transport mode regarding: Railroad transport, Ship/Cruise transport and Coach/Bus transport. However, the air transportation p-value is significant, but the negative correlational coefficient implies that there might be a reverse relationship between cost of air transport and the European tourist's choice.

	Spearman's Rho	**P-value**
Railroad transport cost perception ∘ Railroad transport - choice of travel	-0.126	0.157
Air transport cost perception ∘ Air transport - choice of travel	**-0.205***	**0.020**
Ship/Cruise transport cost perception ∘ Ship / Cruise - choice of travel	-0.066	0.460
Coach / Bus transport cost perception ∘ Coach / Bus transport - choice of travel	0.145	0.103

H2: The safety of transport influences the tourist's choice of mode of transport.

The second hypothesis claims a correlation between safety and the European tourist choice of mode of transport. The calculated p-values of Railroad transport, air transport and ship/cruise transport are highly significant, confirming a positive relationship between safety effect on choice of transport mode. However, the Coach/Bus transport mode analysis did not yield any significant results.

	Spearman's Rho	**P-value**
Railroad transport safety perception ∘ Railroad transport - choice of travel	**0.375***	**<0.001**
Air transport safety perception ∘ Air transport - choice of travel	**0.449***	**<0.001**
Ship / Cruise transport safety perception ∘ Ship / Cruise - choice of travel	**0.339***	**<0.001**
Coach / Bus transport safety perception ∘ Coach / Bus transport - choice of travel	0.166	0.066

H3: The accessibility of transport influences the tourist's choice of mode of transport.

The third hypothesis suggest that accessibility of travel modes influences the choice of transport mode. The marked p-values of railroad transport, air transport and ship/cruise transport confirm the correlation to be highly significant and the positive correlation coefficient presents the positive relationship between perceived accessibility and choice of mode of transport. The couch/bus transport mode does not yield any significant results regarding the correlation.

	Spearman's Rho	**P-value**
Railroad transport accessibility perception ∘ Railroad transport - choice of travel	**0.314***	**<0.001**
Air transport accessibility perception ∘ Air transport - choice of travel	**0.565***	**<0.001**
Ship / Cruise transport accessibility perception ∘ Ship / Cruise - choice of travel	**0.382***	**<0.001**
Coach / Bus transport accessibility perception ∘ Coach / Bus transport - choice of travel	0.055	0.536

H4: The time duration of the trip has an effect on the tourist's choice of mode of transport.

The fourth hypothesis states that the perceived duration period of transportation has a direct effect on the choice of European tourists' mode of transport. Air transport, coach/bus transport and cruise/ship transport modes p-values are insignificant rejecting the hypothesis. However, the railroad transport p-value (being <0.001) presents a strong relationship between the variables.

	Spearman's Rho	**P-value**
Railroad transport time perception ∘ Railroad transport - choice of travel	**0.407***	**<0.001**
Air transport time perception ∘ Air transport - choice of travel	0.132	0.139
Coach / Bus transport time perception ∘ Ship / Cruise - choice of travel	-0.083	0.352
Cruise / Ship transport time perception ∘ Coach / Bus transport - choice of travel	0.065	0.469

H5: The carbon footprint of transport affects the tourist's choice of mode of transport.

The 5th hypothesis predicts that the perceived amount of greenhouse gasses generated by the vehicles affects the European tourist's choice of mode of transport. The Spearman correlation statistical analysis presents no significant values on railroad transport, air transport and coach/bus transport, consequently rejecting the hypothesis. However, the ship/cruise mode of transport p-value is significant, but the correlation coefficient is negative, concluding that there is a reverse relationship between carbon footprint and choice of transport mode. As the amount of carbon footprint of the ship/cruise transport increases, the possibility of choosing that mode decreases.

	Spearman's Rho	**P-value**
Railroad transport carbon footprint perception ∘ Railroad transport - choice of travel	0.090	0.311
Air transport carbon footprint perception ∘ Air transport - choice of travel	0.141	0.112
Ship / Cruise transport carbon footprint perception ∘ Ship / Cruise - choice of travel	**-0.224***	**0.011**
Coach / Bus transport carbon footprint perception ∘ Coach / Bus transport - choice of travel	0.105	0.237

H6: The environmental awareness influences the relationship between the factors and European citizens' choice of transport.

4.1.1.1 Reliability Analysis

In order to measure the internal consistency for the data set a reliability analysis was conducted, yielding the Cronbach's alpha score of 0.689. This score is considered as acceptable because its value is greater than 0.6.

Scale Reliability Statistics

	Mean	SD	Cronbach's α
scale	5.78	1.64	0.689

4.1.1.2 Regression Linear Analysis

The regression analysis was conducted to confirm a correlation and measure its strength between the environmental consciousness of European tourists and each relationship that between the five variables and choice of mode of transport.

- **Cost**
  - Railroad transport

The linear regression coefficient suggests that the model explains almost 20% of the data results. Although almost all the variables have high p-values and low t-values, presenting insignificance and lack of reliability in the correlation, respectively, the composite variable of the environmental responses shows a high level of significance and high reliability on the predicting power of the variable.

Model Fit Measures

Model	R	R^2
1	0.444	0.197

Model Coefficients - Railroad transport - choice of travel

Predictor	Estimate	SE	t	p
Intercept	0.860	2.6983	0.319	0.751
RTCP	0.389	0.4643	0.838	0.404
Interaction variable RTCP	-0.110	0.0785	-1.399	0.164
CEV	1.223	0.4673	2.617	0.010

- Air transport

The linear regression coefficient indicates that the model fails to account for most of the data outcomes. Although the Intercept and ATCP (Air transport cost perception) variables possess relatively high and low t-values, indicating insignificance and lack of reliability in the correlation, respectively. The composite variable of environmental responses and Interaction variable demonstrates a high level of significance and high reliability in terms of the variable's predictive power.

Model Fit Measures

Model	R	R^2
1	0.288	0.0828

Model Coefficients - Air transport - choice of travel

Predictor	Estimate	SE	t	p
Intercept	-1.050	5.056	-0.208	0.836
CEV	1.759	0.805	2.186	0.031
ATCP	1.162	0.633	1.836	0.069
Interaction variable ATCP	-0.240	0.100	-2.395	0.018

- Cruise/Ship transport

The linear regression R-value indicates that the model cannot represent for more than 1% of the observed data outcomes. High p-values and low t-values for the variables indicate insignificance and unreliability in the association,

respectively. The intercept indicates that the coefficient's predictive capacity is very reliable.

Model Fit Measures

Model	R	R^2
1	0.118	0.0138

Model Coefficients - Ship / Cruise - choice of travel

Predictor	Estimate	SE	t	p
Intercept	3.3300	2.8475	1.169	0.244
CEV	0.1483	0.4929	0.301	0.764
S/CTCP	0.2097	0.3488	0.601	0.549
Interaction variable S/CTCP	-0.0389	0.0611	-0.636	0.526

- Couch/Bus transport

The linear regression coefficient indicates that the model explains for about 13% of the observed data outcomes. The C/BTCP (Cous/Bus transport cost perception) variable has a p-value less than 0.05 and a high t-value, indicating that the association is significant and highly reliable. In addition, the values of the Interaction variable demonstrate a degree of relevance and good predictability for the variable‘s capacity.

Model Fit Measures

Model	R	R^2
1	0.366	0.134

Model Coefficients - Coach / Bus transport - choice of travel

Predictor	Estimate	SE	t	p
Intercept	3.0714	1.7284	1.7770	0.078
CEV	-0.0133	0.2629	-0.0508	0.960
C/BTCP	0.9598	0.4179	2.2969	0.023
Interaction variable C/BTCP	-0.1223	0.0619	-1.9760	0.050

- **Safety**

  - Railroad transport

According to the linear regression coefficient, the model adequately explains around 30% of the variation in the data. The p-value for the RTSP(railroad transport safety perception) variable is less than 0.05, and the t-value is large, suggesting that the connection is significant and trustworthy. Furthermore, the CEV(environmental average) results show some degree of applicability and dependability.

Model Fit Measures

Model	R	R^2
1	0.555	0.308

Model Coefficients - Railroad transport - choice of travel

Predictor	Estimate	SE	t	p
Intercept	-1.4629	2.0390	-0.717	0.474
CEV	0.7796	0.3243	2.404	0.018
RTSP	0.7921	0.3133	2.528	0.013
Interaction variable RTSP	-0.0490	0.0489	-1.001	0.319

  - Air transport

As shown by the coefficient of linear regression, the model successfully predicts 20% of the observed phenomena. Intercept and ATSP (Air transport safety perception) have high p-values and low t-values, suggesting that their reliability is, and significance is inexistent.

Model Fit Measures

Model	R	R^2
1	0.467	0.218

Model Coefficients - Air transport - choice of travel

Predictor	Estimate	SE	t	p
Intercept	5.54853	3.0713	1.807	0.073
CEV	-0.24551	0.5140	-0.478	0.634
ATSP	0.45099	0.4077	1.106	0.271
Interaction variable ATSP	0.00674	0.0672	0.100	0.920

- Cruise/Ship transport

Based on the linear regression R-value, it seems that the model does not adequately account for more than 10% of the data outcomes. Most of the variables have high p-values and low t-values, indicating that the relationship is not significant and reliable. According to the intercept variable values, the dependability and significance of the coefficient are satisfactory.

Model Fit Measures

Model	R	R^2
1	0.326	0.106

Model Coefficients - Ship / Cruise - choice of travel

Predictor	Estimate	SE	t	p
Intercept	4.8777	2.3268	2.096	0.038
CEV	-0.4022	0.3670	-1.096	0.275
S/CTSP	0.1036	0.3755	0.276	0.783
Interaction variable S/CTSP	0.0327	0.0565	0.579	0.564

- Couch/Bus transport

The coefficient of linear regression suggests that the model accounts for 11% of the variance in the data. With a t-value over 2.0 and a p-value below 0.05 for the Intercept variable, it may be concluded that the correlation is valid. Furthermore, there is absolutely zero significance or relevance shown by the results of the other variables.

Model Fit Measures

Model	R	R^2
1	0.338	0.114

Model Coefficients - Coach / Bus transport - choice of travel

Predictor	Estimate	SE	t	p
Intercept	5.96656	1.8039	3.3076	0.001
CEV	-0.48723	0.3115	-1.5640	0.120
C/BTSP	0.13108	0.3131	0.4186	0.676
Interaction variable C/BTSP	0.00202	0.0546	0.0370	0.971

- **Accessibility**
  - Railroad transport

Based on the coefficient of linear regression, it seems that the model accounts for around 29% of the measurement seen in the data. The small p-values and high t-values for almost all the variables indicate statistical significance and a high degree of dependability in the association, respectively. The findings of the intercept variable, however, are inadequate and unreliable.

Model Coefficients - Railroad transport - choice of travel

Predictor	Estimate	SE	t	p
Intercept	-2.127	1.5157	-1.40	0.163
CEV	1.135	0.2402	4.72	< .001
RTAP	0.955	0.2480	3.85	< .001
Interaction variable RTAP	-0.109	0.0393	-2.78	0.006

Model Fit Measures

Model	R	R^2
1	0.536	0.287

- Air transport

It can be shown from the linear regression coefficient that the model is accountable for 34% of the observed results. The high t-value for the ATAP (Air transport accessibility perception) factor shows reliability, while the minor p-value indicates significance.

Model Fit Measures

Model	R	R^2
1	0.587	0.345

Model Coefficients - Air transport - choice of travel

Predictor	Estimate	SE	t	p
Intercept	3.2193	1.8317	1.757	0.081
CEV	0.1140	0.2786	0.409	0.683
ATAP	0.6571	0.2625	2.503	0.014
Interaction variable ATAP	-0.0177	0.0408	-0.434	0.665

- Cruise/Ship transport

The R-value for linear regression implies that not more than 17% of the data outcomes are displayed by the model. The majority of the relationships appear insignificant and unreliable because of high p-values and low t-values. However, statistics from the Ship/Cruise Accessibility Perception (S/CTAP) reveal that the coefficient is sufficiently significant and has a high level of predictive ability.

Model Coefficients - Ship / Cruise - choice of travel

Predictor	Estimate	SE	t	p
Intercept	0.0961	1.9066	0.0504	0.960
CEV	0.3740	0.3113	1.2016	0.232
S/CTAP	1.0112	0.3380	2.9920	0.003
Interaction variable S/CTAP	-0.1067	0.0533	-2.0032	0.047

- Couch/Bus transport

The linear regression coefficient indicates that the model explains for about 13% of the observed data outcomes. The C/BTCP (Cous/Bus transport cost perception) variable has a p-value less than 0.05 and a high t-value, indicating that the association is significant and highly reliable. In addition, the values of the Interaction variable demonstrate a degree of relevance and good predictability for the variable ‘s capacity.

Model Fit Measures

Model	R	R^2
1	0.355	0.126

Model Coefficients - Coach / Bus transport - choice of travel

Predictor	Estimate	SE	t	p
Intercept	4.8943	2.2603	2.165	0.032
CEV	-0.3928	0.3764	-1.044	0.299
C/BTAP	0.2933	0.3199	0.917	0.361
Interaction variable C/BTAP	-0.0163	0.0519	-0.314	0.754

- **Time**

- Railroad transport

According to the coefficient of linear regression, the model adequately describes around 22% of the observed phenomena. Statistically, there is no significance or confidence in the association since all the variables have large p-values and small t-values.

Model Fit Measures

Model	R	R^2
1	0.472	0.223

Model Coefficients - Railroad transport - choice of travel

Predictor	Estimate	SE	t	p
Intercept	0.4227	2.1887	0.193	0.847
CEV	0.5842	0.3743	1.560	0.121
RTTP	0.5052	0.3099	1.630	0.106
Interaction variable RTTP	-0.0226	0.0501	-0.452	0.652

- Air transport

According to the linear regression coefficient, this model does not adequately explain the majority of the observed phenomena. The Intercept variable has high t-values and low p-values, showing validity and reliability in the correlation, however the rest of the variables show neither validity nor reliability.

Model Fit Measures

Model	R	R^2
1	0.180	0.0326

Model Coefficients - Air transport - choice of travel

Predictor	Estimate	SE	t	p
Intercept	12.232	3.2573	3.76	< .001
CEV	-1.045	0.6309	-1.66	0.100
ATTP	-0.459	0.3880	-1.18	0.239
Interaction variable ATTP	0.104	0.0735	1.42	0.159

- Cruise/Ship transport

Based on the R-value for linear regression, this model can account for more than 2% of the variation in the data. For the variables, high p-values and low t-values imply insignificance and unreliability in the correlation.

Model Fit Measures

Model	R	R^2
1	0.154	0.0238

Model Coefficients - Ship / Cruise - choice of travel

Predictor	Estimate	SE	t	p
Intercept	4.7176	2.5795	1.829	0.070
CEV	-0.2562	0.4063	-0.631	0.529
C/STTP	0.0582	0.4180	0.139	0.890
Interaction variable C/STTP	0.0162	0.0644	0.252	0.801

- Couch/Bus transport

Approximately 11% of the variance in the data can be accounted for by the model, as shown by the linear regression coefficient. The t-value and p-value for the CEV and Intercept variables present a strong and significant correlation.

Model Coefficients - Coach / Bus transport - choice of travel

Predictor	Estimate	SE	t	p
Intercept	8.886	2.0862	4.26	< .001
CEV	-0.915	0.3435	-2.66	0.009
Interaction variable C/BTTP	0.103	0.0734	1.40	0.165
C/BTTP	-0.524	0.4459	-1.18	0.242

Model Fit Measures

Model	R	R^2
1	0.331	0.110

- **Carbon Footprint**

- Railroad transport

The linear regression coefficient suggests that the model explains almost 24% of the data results. Almost all the variables are characterized by high t-values and low p-values, concluding in significance and reliability in the correlation.

Model Fit Measures

Model	R	R^2
1	0.493	0.243

Model Coefficients - Railroad transport - choice of travel

Predictor	Estimate	SE	t	p
Intercept	-1.240	1.3665	-0.907	0.366
CEV	1.249	0.2235	5.586	< .001
RTCFP	1.200	0.3194	3.758	< .001
Interaction variable RTCFP	-0.185	0.0515	-3.597	< .001

- Air transport

The linear regression coefficient indicates that the model fails to account for more than 2% of the data outcomes. The Intercept variable possess a high t-value and low p-values, indicating significance and great reliability in the correlation, respectively.

Model Fit Measures

Model	R	R^2
1	0.156	0.0243

Model Coefficients - Air transport - choice of travel

Predictor	Estimate	SE	t	p
Intercept	10.6808	3.0537	3.498	< .001
CEV	-0.3915	0.5251	-0.746	0.457
ATCFP	-0.3699	0.4352	-0.850	0.397
Interaction variable ATCFP	0.0388	0.0729	0.533	0.595

- Cruise/Ship transport

Based on the R-value for linear regression, it seems improbable that this model can explain more than 2% of the data variance. Insignificant and unreliable relationships are illustrated by high p-values and low t-values, respectively, for the variables.

Model Fit Measures

Model	R	R^2
1	0.171	0.0294

Model Coefficients - Ship / Cruise - choice of travel

Predictor	Estimate	SE	t	p
Intercept	4.2551	3.1108	1.368	0.174
CEV	0.1757	0.5331	0.330	0.742
S/CTCFP	0.0474	0.4141	0.114	0.909
Interaction variable S/CTCFP	-0.0363	0.0681	-0.533	0.595

- Couch/Bus transport

The linear regression coefficient indicates that the model explains for about 11% of the observed data outcomes. The variables' calculated values present no significance in the effect that environmental consciousness has on the relationship between carbon footprint and European citizen choice of mode of transport.

Model Coefficients - Coach / Bus transport - choice of travel

Predictor	Estimate	SE	t	p
Intercept	3.6197	2.4143	1.499	0.136
CEV	-0.1760	0.4056	-0.434	0.665
C/BTCFP	0.5279	0.3594	1.469	0.144
Interaction variable C/BTCFP	-0.0533	0.0567	-0.940	0.349

Model Fit Measures

Model	R	R^2
1	0.344	0.119

5 Conclusion

5.1 Discussion

In each of the hypotheses offered, there has been a substantial link between the aforementioned factors: cost, safety, accessibility, time, carbon footprint, and environmental awareness. However, not all means of transport have shown a correlation between the component and the mode of travel chosen by European visitors. In addition, the measurement of an individual's environmental awareness in connection to each of the relationships yielded reasonably satisfactory findings.

According to the data, the perceived cost of transportation had a substantial impact on the mode of transportation selected by European tourists. Regarding the other means of transportation investigated, the investigation revealed no direct correlation. On the other hand, safety has a substantial link with the tourist's choice of train, air, and cruise/ship transport modes, indicating that safety is more important than cost when evaluating travel mode. The time factor has a direct bearing on the precise form of train transit used. This study may explain why European visitors' expectations of a quick trip are much greater when they go by train as opposed to by air, cruise/ship, or couch/bus. The findings of the fifth hypothesis indicate that accessibility impacts the selection of train, air, and cruise/ship travel modes among European visitors. The popular opinion is that couch/bus travel is selected mostly because to its accessibility and connectivity to various destinations; nevertheless, the study's limitations or a misinterpretation of the component might account for the surprising findings. The carbon footprint has a direct impact on the selection of cruise/ship transportation mode. This conclusion may result from the European tourist's assessment of the greenhouse gas emissions from the aforementioned forms of transportation. The sixth hypothesis examines the link between the environmental awareness of European tourists and their choice of mode of transportation.

The influence of environmental awareness on the selection of travel, taking cost into account, is strongest for train transport, and weakest for air transport, couch/bus transit, and ship/cruise transport. If air travel leaves a smaller carbon

footprint than train travel, European visitors may be willing to pay a premium for rail travel. In contrast, the importance of the safety factor is considered to be greater, indicating that the connection is generally less than that of the preceding component, but in the same order from strongest to weakest. Moreover, the impact of the environment on the accessibility of the specified modes of transportation is greatest for air travel, lowest for rail transport, ship/cruise transport, and couch/bus transit. Environmental awareness seems to have little to no effect on the link between time factors and method of transportation, according to the data. In addition, the association between environmental awareness and the carbon footprint influence on the choice of train transport method is adequate.

5.2 Recommendations

The data reported in this thesis will serve as a basis for future research on the mode of transportation chosen by tourists. Data scientists and academics might acknowledge some of the conclusions presented in the study and elaborate more on the correlations tested as well as new variables that might have direct relationships with the European tourist's choice of mode of transport.

As the tourism industry is continually changing, there is a need for recent studies to be conducted. These results will assist tourism's private and public sectors to acknowledge what their customers prioritize and adjust their services and products accordingly. As a result, the tourism industry will improve and contribute to an increase in the overall economy of certain European countries, enabling their tourism capacity to run and develop efficiently.

In addition, more insights about the significance of the aforementioned aspects might result in transportation network enhancement, consumer awareness of environmentally friendly modes of transportation, and important data for enterprises that offer transportation or leisure activities to European visitors. Governmental institutions would use the study's results as a foundation for future analysis and evaluation trials to maximize the capacities of the public transportation network system. Nevertheless, the outcomes of the thesis would be used to communicate and establish environmental awareness in European

tourists' travel choices. By emphasizing the disadvantages of the exponential increase of carbon footprint over the years, the tourism industry can possibly alter individuals' perceptions and consequently their choices for e greener environment.

5.3 Limitations

The manufacturing and distribution of the survey needed limited resources. The monetary capacities were limited; hence the distribution of the survey was mostly performed through the use of social media platforms, ensuring a minor number of responders. Due to the low number of participants, some of the modes inside the hypotheses supposed to be retained were null, as shown by statistical findings. This resulted in the confirmation of a limited number of specific transport mode parameters in connection to European tourists' preference for the mode of transport. In addition, the poll was disseminated socially, resulting in reduced nationality, ethnicity, and religious diversity. It is normal for an individual's social group to share beliefs, ethnicity, and religion. Although the thesis is subjected to European tourists' and performed accordingly, there are some limitations considering the number of participants in the survey and their association with each other.

Bibliography

Aviation Safety Policy in Europe. (n.d.). Transport.ec.europa.eu. https://transport.ec.europa.eu/transport-modes/air/aviation-safety-policy-europe_en

Barcelona Field Studies Centre. (2019). *Tourism Costs and Benefits*. Geographyfieldwork.com. https://geographyfieldwork.com/TourismProsCons.htm

Booking.com. (June 3, 2021). Share of travelers that believe sustainable travel is important worldwide in 2021 [Graph]. In Statista. Retrieved April 14, 2022, from https://www.statista.com/statistics/1126996/traveler-attitudes-sustainability/

Butler, M., World Tourism Organization. Tourism Trends and Marketing Strategies Programme, & World Tourism Organization. Regional Programme for The Americas. (2010). *Cruise tourism : current situation and trends*. World Tourism Organization.

Calzada, J., & Fageda, X. (2018). Route expansion in the European air transport market. *Regional Studies*, *53*(8), 1149–1160. https://doi.org/10.1080/00343404.2018.1548763

Campisi, T., Acampa, G., Mrak, I., & Torrisi, V. (2021). Preface of the Symposium "The Development of Sustainable and Accessible Infrastructure and Modelling" (DSAIM-2020). *INTERNATIONAL*

CONFERENCE of COMPUTATIONAL METHODS in SCIENCES and ENGINEERING ICCMSE 2020, *2343*. https://doi.org/10.1063/5.0047756

Collins, A., & Potoglou, D. (2019). Factors influencing visitor travel to festivals: challenges in encouraging sustainable travel. *Journal of Sustainable Tourism*, *27*(5), 668–688. https://doi.org/10.1080/09669582.2019.1604718

Cooper, C. (2012). *Essentials of tourism*. Financial Times Prentice Hall, Pearson.

David Timothy Duval. (2007). *Tourism and transport : modes, networks and flows*. Channel View Publications, Cop.

Dickinson, J. E., & Peeters, P. (2012). Time, Tourism Consumption and Sustainable Development. *International Journal of Tourism Research*, *16*(1), 11–21. https://doi.org/10.1002/jtr.1893

Directorate-General for Mobility and Transport. (2022, March 28). *Road safety in the EU: fatalities in 2021 remain well below pre-pandemic level*. Ec.europa.eu. https://ec.europa.eu/transport/road_safety/news-events/news/road-safety-eu-fatalities-2021-remain-well-below-pre-pandemic-level-2022-03-28_en

Esteve-Perez, J., Garcia-Sanchez, A., & Muñoz-Paupie, A. (2019). Cruise Traffic Seasonality Patterns in the Western Mediterranean and the Adriatic Sea: A Challenge to Port Operators. *Coastal*

Management, *47*(4), 362–386. https://doi.org/10.1080/08920753.2019.1612701

European Rail Traffic Management System. (n.d.). Transport.ec.europa.eu. Retrieved April 12, 2022, from https://transport.ec.europa.eu/transport-themes/infrastructure-and-investment/trans-european-transport-network-ten-t/european-rail-traffic-management-system_en

Gamero, N., Silla, I., Sainz-González, R., & Sora, B. (2018). The Influence of Organizational Factors on Road Transport Safety. *International Journal of Environmental Research and Public Health*, *15*(9), 1938. https://doi.org/10.3390/ijerph15091938

Greenhouse gas emissions from transport in Europe. (2021, November 18). Www.eea.europa.eu. https://www.eea.europa.eu/ims/greenhouse-gas-emissions-from-transport

Haydock, D. (2022, April 18). *SNCF launches mainline Ouigo service*. International Railway Journal. https://www.railjournal.com/news/sncf-launches-mainline-ouigo-service/

Hayes, B. E., Perander, J., Smecko, T., & Trask, J. (1998). Measuring Perceptions of Workplace Safety. *Journal of Safety Research*, *29*(3), 145–161. https://doi.org/10.1016/s0022-4375(98)00011-5

Haynes, R., Lovett, A., & Sünnenberg, G. (2003). Potential Accessibility, Travel Time, and Consumer Choice: Geographical Variations in General Medical Practice Registrations in Eastern

England. *Environment and Planning A: Economy and Space*, *35*(10), 1733–1750. https://doi.org/10.1068/a35165

Heinold, A., & Meisel, F. (2018). Emission rates of intermodal rail/road and road-only transportation in Europe: A comprehensive simulation study. *Transportation Research Part D: Transport and Environment*, *65*, 421–437. https://doi.org/10.1016/j.trd.2018.09.003

J Christopher Holloway, & Humphreys, C. (2020). *The business of tourism*. Sage Publications.

Jensen, S., & Svendsen, G. T. (2016). Social Trust, Safety and the Choice of Tourist Destination. *Business and Management Horizons*, *4*(1), 1. https://doi.org/10.5296/bmh.v4i1.9232

Kamb, A., Lundberg, E., Larsson, J., & Nilsson, J. (2020). Potentials for reducing climate impact from tourism transport behavior. *Journal of Sustainable Tourism*, *29*(8), 1365–1382. https://doi.org/10.1080/09669582.2020.1855436

Koetse, M. J., & Rietveld, P. (2009). The impact of climate change and weather on transport: An overview of empirical findings. *Transportation Research Part D: Transport and Environment*, *14*(3), 205–221. https://doi.org/10.1016/j.trd.2008.12.004

Konovalova, A. A., University, S. S., Russia, & Vidishcheva, E. V. (2013). Elasticity of Demand in Tourism and Hospitality. *European Journal of*

Economic Studies, *4*(2), 84–89. https://www.academia.edu/24860090/Elasticity_of_Demand_in_Tourism_and_Hospitality

Litman, T. (2019). *Understanding Transport Demands and Elasticities How Prices and Other Factors Affect Travel Behavior*. https://vtpi.org/elasticities.pdf

MADHUWANTHI, R. A. M., MARASINGHE, A., RAJAPAKSE, R. P. C. J., DHARMAWANSA, A. D., & NOMURA, S. (2016). Factors Influencing to Travel Behavior on Transport Mode Choice. *International Journal of Affective Engineering*, *15*(2), 63–72. https://doi.org/10.5057/ijae.ijae-d-15-00044

Marrero, Á. S., Marrero, G. A., González, R. M., & Rodríguez-López, J. (2021). Convergence in road transport CO2 emissions in Europe. *Energy Economics*, *99*, 105322. https://doi.org/10.1016/j.eneco.2021.105322

Maskeliūnaitė, L., Sivilevičius, H., & Podvezko, V. (2009). RESEARCH ON THE QUALITY OF PASSENGER TRANSPORTATION BY RAILWAY. *TRANSPORT*, *24*(2), 100–112. https://doi.org/10.3846/1648-4142.2009.24.100-112

Mason, Keith & Morrison, W. & Stockman, I. (2013). Liberalization of air transport in Europe and the evolution of 'low-cost' airlines. Liberalization in Aviation: Competition, Cooperation and Public Policy. 141-156.

Moyano, A., Rivas, A., & Coronado, J. M. (2019). Business and tourism high-speed rail same-day trips: factors influencing the efficiency of high-speed rail links for Spanish cities. *European Planning Studies*, *27*(3), 533–554. https://doi.org/10.1080/09654313.2018.1562657

Ouedraogo, K. A., Beugin, J., El-Koursi, E.-M., Clarhaut, J., Renaux, D., & Lisiecki, F. (2018). Toward an Application Guide for Safety Integrity Level Allocation in Railway Systems. *Risk Analysis*, *38*(8), 1634–1655. https://doi.org/10.1111/risa.12972

Peeters, P., Szimba, E., & Duijnisveld, M. (2007). Major environmental impacts of European tourist transport. *Journal of Transport Geography*, *15*(2), 83–93. https://doi.org/10.1016/j.jtrangeo.2006.12.007

Peeters, P., van Egmond, T., & Visser, N. (2004). European tourism, transport and environment. *Final Version. Breda: NHTV CSTT*.

Penz, E., Hartl, B., & Hofmann, E. (2019). Explaining consumer choice of low carbon footprint goods using the behavioral spillover effect in German-speaking countries. *Journal of Cleaner Production*, *214*, 429–439. https://doi.org/10.1016/j.jclepro.2018.12.270

Rail and waterborne — best for low-carbon motorized transport — European Environment Agency. (2021, March 24). Www.eea.europa.eu. https://www.eea.europa.eu/publications/rail-and-waterborne-transport

Rail Europe - Rail travel planner Europe - Train travel in Europe (Eurostar – TGV – Eurail – Euro rail). (2018). Raileurope.com. https://www.RailEurope.com

Rail Safety. (n.d.). Transport.ec.europa.eu. Retrieved April 12, 2022, from https://transport.ec.europa.eu/transport-modes/rail/interoperability-safety/rail-safety_en

Rodrigue, J.-P. (2020). *The Geography of Transport Systems*. Routledge. https://doi.org/10.4324/9780429346323

Safety of passenger ships. (n.d.). Transport.ec.europa.eu. Retrieved April 12, 2022, from https://transport.ec.europa.eu/transport-modes/maritime/safety-and-environment/safety-passenger-ships_en

Sharpley, R., & Telfer, D. J. (2015). *Tourism and development : concepts and issues*. Channel View Publications.

Skyscanner | Find the cheapest flights fast: save time, save money! (n.d.). Www.skyscanner.at. Retrieved April 18, 2022, from https://www.skyscanner.at/?locale=en-US

Spalević, Ž., & Stanišić, S. (2021). Economic growth of the tourism sector in the Covid-19 pandemic during 2021. *The European Journal of Applied Economics*, *18*(2), 1–14. https://doi.org/10.5937/ejae18-33977

Strizhakova, Y., Coulter, R. A., & Price, L. L. (2021). EXPRESS: The Fresh Start Mindset: A Cross-National Investigation and Implications for

Environmentally Friendly Global Brands. *Journal of International Marketing*, *29*(4), 1069031X2110218. https://doi.org/10.1177/1069031x211021822

Sven Gross. (2014). *Introduction to tourism transport*. Cabi.

Walton, J. K. (2018). tourism | Definition, History, Types, Importance, & Facts. In *Encyclopedia Britannica*. https://www.britannica.com/topic/tourism

Wang, D. D. (2019). Assessing road transport sustainability by combining environmental impacts and safety concerns. *Transportation Research Part D: Transport and Environment*, *77*, 212–223. https://doi.org/10.1016/j.trd.2019.10.022

Weber, K., Zangl, M., Zahid, M. U., & Holzner, M. (2022). Environmental Impact Evaluation of a European High Speed Railway Network along the 'European Silk Road'.

Western Mediterranean Cruise with Nautica on 23/04/2022 (Single cabin) - 12 days. (n.d.). Www.seascanner.com. Retrieved April 15, 2022, from https://www.seascanner.com/cruise-k200980-western-mediterranean-nautica-lisbon-civitavecchia-rome?erw=1

World Tourism Organisation (Madrid. (1996). *Tourist safety and security : practical measures for destinations.* World Tourism Organization.

World Tourism Organization. (2001). *WTO Seminar on tourism and air transport : Funchal, Madeira, Portugal 25 and 26 May 2000 = Séminaire omt sur le tourisme et le transport aérien : Funchal, Madère(Portugal) 25-26 mai 2000.* World Tourism Organization.

World Tourism Organization and International Transport Forum. (2019). *Transport-Related CO2 Emissions of the Tourism Sector, UNWTO, Madrid.* https://doi.org/10.18111/9789284416660

Yang, E. C. L., & Nair, V. (2014). Tourism at Risk: A Review of Risk and Perceived Risk in Tourism. *Asia-Pacific Journal of Innovation in Hospitality and Tourism (APJIHT)*, *3*(2). https://doi.org/10.7603/s40930-014-0013-z

Zhao, H., Yao, X., Liu, Z., & Yang, Q. (2021). Impact of Pricing and Product Information on Consumer Buying Behavior with Customer Satisfaction in a Mediating Role. *Frontiers in Psychology*, *12*. https://doi.org/10.3389/fpsyg.2021.720151