

Article

Managing Airline Emissions, Noise, and Bird Strikes: Passengers' Perspectives on Airlines' Extrinsic and Intrinsic Environmental Practices

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Abstract: The aviation industry significantly contributes to environmental degradation, particularly in airline emissions, noise pollution, and bird strikes. Despite the growing concern for sustainability in aviation industries, there is a lack of research on how passengers perceive airlines' efforts to manage airlines' environmental degradation. This study addresses this gap by investigating how passengers perceive airlines' intrinsic and extrinsic environmental practices toward these issues. Using a scenario-based experiment, this study found that passengers are more likely to use an airline and spread positive word of mouth when environmental practices form part of intrinsic management efforts rather than extrinsic environmental practices, suggesting that airlines should focus on implementing sustainable practices that align with their core values rather than simply adopting superficial measures for public relations. The findings of this research have important theoretical and managerial implications for airline managers in terms of enhancing their sustainability practices. By prioritizing intrinsic management efforts, airlines can improve their environmental performance and enhance their reputation among environmentally conscious passengers, ultimately leading to increased profitability and long-term sustainability for the industry.

Keywords: intrinsic initiative; extrinsic initiative; airline emissions; airline noise; airline bird strikes; passenger behavior

1. Introduction

Air transportation is one of the essential modes of transportation, as it is used to transport goods and people over long distances in a very short period. Individuals can now travel more easily and quickly to anywhere on Earth thanks to the advances in air travel [1,2]. Air travel has dramatically affected international trade and business; it has allowed companies to expand their operations into new markets, increase their revenues, and provide jobs by providing a fast and efficient way to move goods [1]. It also allows countries to communicate and promote cultural exchange and international understanding [2]. Air travel benefits the tourism industry, and tourists now have more

possibilities to discover other countries and cultures, because it is easier for them to travel long distances in a short time [3]. For many countries around the world, it has increased tourism revenues [2], which can be used to improve infrastructure and create jobs. Despite the benefits of air travel [1], air travel has the potential to harm the environment, as aircraft release large amounts of carbon dioxide into the atmosphere [4], contributing to climate change and global warming [5]. Aircraft also causes noise pollution, which can devastate nearby communities and destroy wildlife habitats [6] due to bird strikes [7]. Furthermore, planes use much fuel, which can, if not adequately controlled, lead to air pollution [5].

Airline passengers increasingly demonstrate pro-environmental behavior regarding their choices and perceptions of airlines [8]. Any behavior that promotes environmental protection is considered pro-environmental. Reducing energy use, recycling, public transportation, and avoiding single-use plastics are a few examples of pro-environmental behavior [9]. Actions which show a commitment to sustainability and environmental protection can influence how passengers view airlines [8]. Passengers are more likely to trust airline brands when they perceive that the airlines are trying to reduce their negative environmental impacts [10]. Passengers with pro-environmental behavior tend to choose airlines that commit to reducing their environmental impact [8]. Passengers also prefer those airlines that provide information about their environmental initiatives and demonstrate a commitment to sustainability [10]. However, there is a crucial gap in the environmental context of airlines, because no study has investigated how passengers perceive the airlines' environmental protection campaigns from an intrinsic attribution as compared with an extrinsic attribution, considering aircraft emissions, noise, and bird strikes.

Intrinsic environmental practices can be described as practices perceived as sincere, and airlines engage in environmental protection practices because they care for the environment (internal attribution) [11,12]. In contrast, extrinsic environmental practices are perceived to be performed because of social or legal enforcement on airlines that they must protect the environment (external attribution) [13,14]. Intrinsic and extrinsic perceptions of consumers toward initiatives that preserve the environment lead to different behavioral outcomes [11,12]. Therefore, consumers tend to view service providers who care about the environment for internal reasons rather than external forces and enforcement more positively [13]. Therefore, we aimed to contribute by studying how passengers behave toward intrinsic versus extrinsic airline environmental protection systems against aircraft emissions, noise, and bird strikes to fulfill the current gap through the following objective:

To analyze the impact of intrinsic and extrinsic airline environmental protection systems on passenger behavior in response to aircraft emissions, noise, and bird strikes.

2. Literature Review

2.1. Airline Impacts on the Environment

2.1.1. Aircraft Emissions

In the past centuries, the emissions from burning materials were low compared with those from industrial machinery after the Industrial Revolution [5]. With technological progress, petroleum-derived materials were used to operate factories and machines, and petroleum materials were also used as fuel for transportation [4]. In the vein of air transportation, several gases are produced due to the combustion of fuel by the aircraft engine, resulting in harm to the environment [6]. Aircraft emissions result from the combustion of aircraft fuel from takeoff to landing. This combustion produces a group of gases (carbon dioxide, nitrogen oxides, carbon monoxide, and nitrogen [4]) that affect the environment and contribute to climate change. The combustion of the fuel produces gases such as carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), ozone, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆) [6]. It also produces carbon monoxide, which results from incomplete burning of the fuel, and is very toxic to humans, as it combines with the hemoglobin in the blood, producing carboxyhemoglobin (CARBOXY HB). This hinders the transport of oxygen in the blood to the body's cells, and sometimes results in death [5,15].

Fuel combustion in aircraft engines produces several gases, including carbon monoxide, nitrogen oxide, nitrogen, and water vapors [16]. According to the International Civil Aviation Organization's website, aircraft emissions are defined as any emissions deriving from the fuel combustion chamber [17]. This combustion produces a group of gases that impact the global environmental level of these gases. This definition means that the combustion chamber produces several gases that have an effect on which of these gases are produced because the gases are inherently diffused [18].

The assessment of air quality and atmospheric pollution comprises one of the essential elements of environmental reviews [19]. Moreover, emissions have negative impacts on the surrounding atmosphere, which is scientifically called the "Troposphere", and another layer, called the "Stratosphere", stretching to a height of 55 to 80 km, characterized by a stable temperature and not producing storms [20]. Therefore, most flight operations are conducted in this layer. This layer is surrounded by a layer called the ozone layer, which helps absorb the Sun's harmful ultraviolet rays [21]. This is due to the combustion of fuel, from which emerges a group of toxic gases, such as carbon oxides and nitrogen oxides [22]; this leads to a reduction in the concentration of ozone in the ozone layer, consequently resulting in an increase in the amount of infrared radiation that reaches the Earth, which has harmful effects on human health [15].

The gases emanating from airplanes, such as carbon monoxide, nitrogen oxide, and carbon dioxide, affect the air, and are then inhaled by humans, consequently causing illnesses and diseases (e.g., heart disease, shortness of breath, chronic headaches). For pregnant women, these gases can sometimes cause fetal defects [23,24]. Since fuel is the backbone of the operation of aircraft and the leading cause of emissions due to its combustion in the combustion chamber of the aircraft engine, it becomes necessary to research fuels and understand their impact on the environment. Thus, the possibility of alternative fuels to reduce the environmental impact of fuel combustion has gained relevance [23].

2.1.2. Aircraft Noise

The topic of noise is now attracting the attention of international and regional civil aviation organizations due to its importance in affecting the environment. According to the official website of the International Civil Aviation Organization (ICAO), the noise emanating from aircraft is defined as the loud sounds made by the aircraft engines from the beginning of its operation and takeoff to landing, leading to a significant impact on the environment by the noise caused by these processes [25]. Aircraft noise has been divided into two sources; (a) the sound of the plane, i.e., the noise emanating from the fuselage or the general structure of the aircraft during takeoff and landing, and (b) the sound of the engine, i.e., the noise generated by the fan and turbine inside the engine [26]. Noise caused by air traffic is one of the factors of environmental pollution during the past decade. Aircraft noise is one of the reasons for the presence of noise at the global level [27], and the noise caused by aircraft affects the environment by causing damage to humans and animals [28]. According to Benz et al. [6], Huang et al. [28], and Baudin et al. [29], the noise emanating from airplanes affects a person in different ways, for instance (a) hearing impairment and (b) insomnia. Hearing impairment is caused when the intensity of noise emanating from aircraft increases more than 90 Decibels for a period related to fatigue of the eardrum. It eventually leads to hearing loss at the distant level, especially residential areas near airports. Residents of areas near airports have insomnia at night while sleeping because of the noise that planes make when landing and taking off. The noise negatively affects human health on a long-term level, as it affects blood circulation, blood pressure, low cholesterol in the blood, and immunodeficiency. Also, the noise emanating from airplanes affects children very much, and leads to a significant increase in blood pressure. The noise affects animals of various kinds, whether mammals or birds, leading to insomnia for mammals. It negatively affects birds, especially in the mating season, as the high noise generated by aircraft and high vibrations lead to egg damage.

A growing body of scholarship underscores the adverse impacts of airport noise pollution on surrounding communities. Optimized takeoff procedures devised by Behere and Mavris [30] demonstrate the potential to reduce affected populations by a high percentage. However, projections by Pretto et al. [31] suggest that annoyance will proliferate amid expanding aviation activity. Moreover, findings by Petri et al. [32] elucidate the pernicious cardiovascular effects of aircraft noise, including increased hypertension risk at levels above 55 dB. These empirical insights comport with the broader literature underscoring noise as an oft-overlooked externality of mobility systems. While operational refinements represent an incremental remedy, curtailing aviation's environmental and health consequences necessitates a comprehensive approach prioritizing technological innovation and restrained growth. The development and adoption of noise-attenuating engine systems offer a salient near-term solution. However, additional research on aircraft and procedure design is needed to facilitate the sustainable expansion of airport infrastructure. At its core, reconciling mobility demands with community impacts necessitates deliberative governance and multi-stakeholder coordination. Aviation regimes can cultivate equitable and ecologically conscious outcomes by internalizing the externalities of noise through regulation, modeling, and technocratic oversight. In summary, mitigating the acoustical burdens documented in recent scholarship obliges systemic changes through which mobility priorities are balanced with social and environmental welfare.

Moreover, the noise emanating from aircraft affects the working environment, where the work assigned is not completed perfectly in the absence of comfort and tranquility, as scientific research has indicated that noise affects the level of psychological comfort and, therefore, the working environment [33]. Moreover, the loud noise emitted by aircraft damages the building structures and real estate near the airports. The noise affects the prices of real estate next to airports; real estate prices next to airports decrease due to the noise intensity. The closer the plane is to cities and real estate, the more intense the noise is. Whenever the aircraft is at a high altitude, it is not affected by noise; in contrast, when the aircraft approaches 4000 feet, it starts to be affected by noise [34].

2.1.3. Aircraft and Bird Strikes

The field of bird collisions has recently become one of the most critical areas that has attracted the attention of researchers in the field of aviation. Due to the importance of environmental protection, aircraft and bird strikes fall in the context of the increasing proportion of passengers and the development of the air transport industry [7]. The process of bird collisions with airplanes concerns human life, as a plane can crash once a bird strikes with the plane, resulting in the loss of human life, the birds' lives, and environmental protection. Due to the importance of the topic of bird collisions with airplanes, bird collision has its department, which is called Airport Bird Hazard Management (ABHM) [35]. This department, which is located at most international airports, aims to try to reduce the risk of aircraft colliding with birds to avoid damage to both sides by collecting and analyzing information about flocks of birds, their movements, and how to avoid them on the part of pilots [36].

Birds are affected by the flight movement of aircraft through two theories; the size of the plane determines the nature of the collision of aircraft and birds, the types of birds, and the aircraft's height [37]. In terms of the size of the aircraft, a plane crash with birds affects many birds when the collision is with aircraft of large sizes and cargo transport aircraft, as these aircrafts contain large engines that swallow a more significant number of birds of various types [35], leading to the death of these birds and considerable damage to aircraft engines [38]. As for the types of birds, there are many types of birds affected by air traffic, and the effect varies depending on the size of the bird. The larger the size of the bird, the stronger the collision is, and the damage is significant, like flying geese [35]. As for the aircraft's height, the higher its altitude, the higher its speed, leading to an intense collision with birds [38].

According to the agency Reuters, some indications of colliding with birds are hazardous. According to a media report from 2012, bird strikes have been a rising issue for airports in recent years. The report cited data showing that between April 2010 and the time of reporting [36], Chicago's O'Hare International Airport recorded 400 bird strike incidents, while New York's LaGuardia Airport tallied 280 such collisions. LaGuardia Airport also experienced a record 450 bird strikes later in the period, resulting in significant damage to aircraft and major losses to the flocks of birds involved. The increasing frequency of bird strikes points to improved mitigation measures at airports to ensure the safety of aircrafts and their passengers. While the report focused on incidents at American airports, bird strikes are a global issue impacting all regions, with problems associated with the cohabitation of birds and aviation.

Regarding the negative impacts of airlines on the environment, it is crucial to study passengers' perceptions of airlines' negative impacts on the environment. First, understanding how passengers perceive the environmental effects of airlines can enable airlines to design and implement more effective sustainability initiatives that better align with passengers' beliefs and values [10]. Thus, it can increase passengers' willingness to support sustainability initiatives, resulting in more positive environmental outcomes [8].

There are significant variations between bird strikes that cause engine damage and those that cause passengers to perceive the environment negatively. Bird strikes pose a severe safety and cost concern to airlines regarding engine damage. Bird strikes with aircraft engines can result in catastrophic engine failure and, potentially, the loss of the aircraft. The size and kind of bird as well as the height and speed of the aircraft are all factors that affect how severely the engine is damaged. Larger birds and faster airplanes typically cause more severe engine damage. Over the years, bird strikes have cost airlines millions of dollars in engine repairs, delayed flights, and canceled flights.

However, from the perspective of how passengers perceive the environment, bird attacks illustrate a more general issue of how airlines affect the environment. Concerns over how airplanes affect the environment in terms of pollution, waste, and wildlife disturbance are growing among passengers. Although passengers may be aware that bird strikes constitute a safety risk, they most likely perceive it in the context of the environmental sustainability of airlines. Our study focuses on how passengers see airlines' involvement in environmental deterioration, including bird strikes. It is critical to comprehend passengers' perspectives for two key reasons.

It can assist airlines in creating sustainability initiatives that more effectively align with the values of passengers, potentially enhancing the success of the programs. Passengers may be more inclined to support such initiatives as a result. Moreover, airlines can improve their environmental performance by better-matching sustainability measures with passengers' interests and concerns beyond decreasing engine damage from bird strikes. As a result, airlines may be able to improve their reputations as well as establish deeper connections with passengers who care about the environment. Moreover, passengers are increasingly concerned about airlines' broader environmental impacts, including wildlife disturbance, emissions, and waste. While safety is the primary reason behind airlines trying to avoid bird strikes, passengers see it as one part of airlines' contribution to environmental problems. Understanding how passengers perceive these environmental issues, including bird strikes, can help airlines design sustainability initiatives that resonate more effectively. This, in turn, may improve airlines' actual ecological performance and reputation. Studies have shown that non-safety factors, like environmental stewardship, influence passengers' choice of airlines. Therefore, airlines that demonstrate strong environmental practices, including effective bird strike reduction, may gain a competitive advantage.

2.2. Passengers' Intrinsic and Extrinsic Attribution toward Airlines' Environmental Initiatives

One of these practices can include adhering to laws and guidelines relevant to environmental protection, such as emission norms or waste management specifications [13]. While these steps to comply with rules may be necessary, they may not necessarily be seen

as severe or sincere attempts to safeguard the environment [12]. Since it encourages people to uphold their pro-environmental behaviors, and strengthens their commitment to ecological preservation, pro-environmental behavior toward service providers is essential [14]. This can involve advocating for more stringent environmental laws and regulations, aiding businesses with critical ecological projects and policies, making recommendations on how service providers can better manage their environmental impact, and more [12]. Pro-environmental behavior also implies that all parties engaged in service supply should consider environmental conservation crucial and severe [11], especially when it comes to intrinsic or extrinsic pro-environmental practices.

Intrinsic environmental practices are seen to be carried out honestly for the environment. Service providers engage in these practices because they sincerely care about the environment and want to preserve the environment [11]. These practices include using renewable energy sources, recycling materials, and reducing trash, to name a few. Intrinsic environmental practices are usually more sincere than extrinsic ecological practices, because they result from real environmental care rather than outside pressure or enforcement [13]. Intrinsic environmental practices have become synonymous with carrying out environmental initiatives with a sense of environmental sincerity. These practices have found ground in service providers, who embrace them out of honest, genuine concern and care for the environment [12]. Examples of intrinsic environmental practices include using renewable energy sources, recycling materials, and reducing trash. Such practices are executed to preserve nature without compromising the needs of future generations. They result from collective environmental stewardship, which goes beyond mere economic gain to encompass ethical considerations [12].

Passengers may perceive intrinsic environmental practices as stemming from an airline's authentic desire to benefit the environment. For instance, a carrier voluntarily switching to sustainable aviation fuel demonstrates a proactive commitment to emission reductions. This intrinsic change reflects core values rather than external pressure. In contrast, extrinsic efforts like noise mitigation programs around airports may be seen as fulfilling government obligations or reputation management. While still beneficial, customers are more likely to question the motivations behind extrinsic initiatives that provide indirect community benefits. In summary, passengers associate intrinsic practices with an airline's eco-conscious culture. These internal changes align with the expectations of a progressive, green-minded carrier. Conversely, extrinsic programs can appear driven by regulations and corporate interests rather than genuine environmental dedication. Distinguishing the underlying inspirations between intrinsic and extrinsic efforts allows airlines to communicate sustainability better in line with customer perceptions. Authentic, voluntary initiatives resonate more powerfully with passengers than obligatory, indirect measures.

Service providers undertaking intrinsic environmental practices are motivated by their love for the environment, and are not influenced by outside pressure, such as public sentiment or legal requirements [13]. They see themselves as key players in environmental conservation, take responsibility, and adhere to environmental standards that are not just fundamental but often transcend existing regulatory frameworks. On the other hand, extrinsic environmental practices are assumed to be implemented due to public pressure or legal requirements positioned on service providers to safeguard the environment [11]. Extrinsic environmental practices are considered reactive measures service providers take to respond to regulatory threats or public pressure to preserve the environment [11]. Proponents of extrinsic environmental practices believe that companies adopt them only to conform to the minimum required standards as well as to avoid legal penalties [13].

However, extrinsic environmental practices, while reactive to some degree, also offer service providers an opportunity to embrace environmental consciousness as well as to become positive net contributors to the environment. Extrinsic environmental practices can be seen as less sincere since their execution is primarily to comply with legislation rather than a strong, heartfelt environmental ethic [12]. Unlike extrinsic ecological practices, intrinsic environmental practices are internalized, heartfelt, and founded on genuine

environmental concern. As previously discussed, research has shown that passengers respond positively to airlines that demonstrate a sincere commitment to environmental sustainability. This positive response can lead to an intention to use the services of such airlines. Moreover, the literature on consumer behavior suggests that this intention and positive behavioral outcomes can result in positive word-of-mouth recommendations to potential consumers [28,39]. Word of mouth (WOM) is a powerful tool, whereby consumers recommend (or not) certain services to others [40,41]. Furthermore, it has been argued that passengers' intrinsic perception of an airline's environmental practices leads to positive behavioral outcomes.

Based on the previous arguments, this study proposes the following hypotheses (see Figure 1):

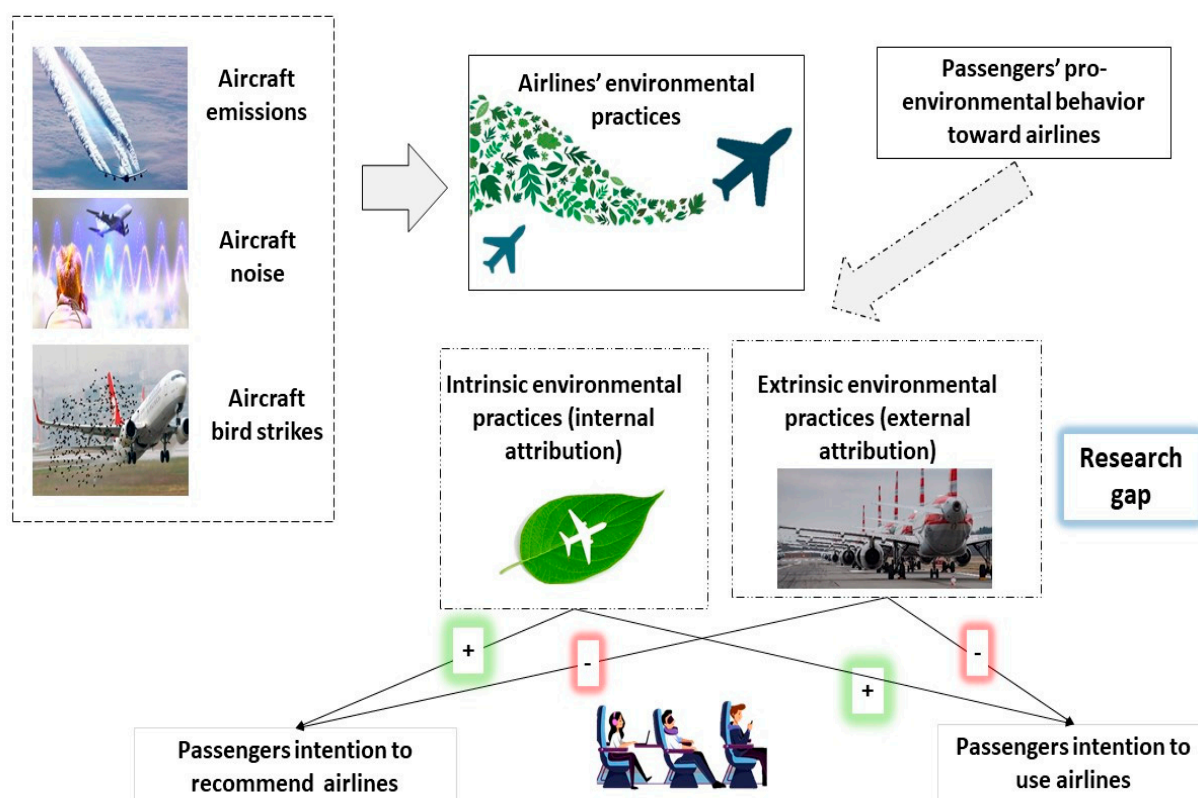


Figure 1. The research framework and the current gap.

H1: Passengers are more likely to use airlines that exhibit intrinsic environmental practices.

H2: Passengers have no tendency to use airlines that exhibit extrinsic environmental practices.

H3: Passengers will positively spread word of mouth about airlines that exhibit intrinsic environmental practices.

H4: Passengers will negatively spread word of mouth about airlines that exhibit extrinsic environmental practices.

3. Materials and Methods

3.1. Construct Measures

We employed scenario-based experiments to achieve this study's aims. An scenario-based experimental methodology allows for a more accurate assessment of how passengers react in a real-world scenario [42], making it an effective way to gauge passengers' perceptions toward airlines' environmental protection campaigns [43]. We designed scenarios specific to the negative environmental airline impacts being discussed in the current study

literature, such as aircraft noise, emissions, and bird strikes. It helped us learn more about how passengers view airlines' environmental campaigns (intrinsic vs. extrinsic) and their effectiveness by developing scenarios more closely aligned with the actual conditions passengers may experience. Furthermore, scenario-based experimentation methodology enables more precise data collection, because it can be carried out in a controlled setting, where variables can be observed and changed as necessary [43]; this guarantees the validity and dependability of the results [42]. We ensured that the scenarios were understood by asking tourism professors to review them before applying them to avoid any mistakes or misconceptions.

Scenario-based experiments are a useful method when it is not feasible or ethical to directly manipulate the variables of interest in a real-world setting. Our study examined passengers' perceptions of airlines' intrinsic versus extrinsic environmental practices. However, this study could not manipulate how airlines implement and communicate their practices in the real world; thus, conducting an experiment involving real airlines as well as passengers was impossible. Instead, this study designed a scenario-based experiment, where the study described hypothetical airlines with either intrinsic or extrinsic environmental practices. This study then presented these scenarios to participants, and measured their responses. While not a true reflection of real-world airline practices, this approach allowed us to isolate and manipulate the key variables—intrinsic vs. extrinsic motivations—in a controlled manner. This study took several steps to ensure that the scenario descriptions were realistic and credible. This study based the scenarios on examples of actual environmental practices commonly used by airlines. This study pre-tested the scenarios with aviation experts to refine the wording and details. The participants were screened to include only those with past airline travel experience so that their experiences could be related to the scenarios.

Scenario 1 (intrinsic): Imagine traveling with an airline whose aircraft' emissions, noise, and bird strikes lead to environmental degradation. The airlines decided to act and began implementing environmental protection initiatives for aircraft emissions, noise, and bird strikes. They encourage passengers to behave environmentally toward their flights and increase environmental awareness among residents with sincere initiatives, not by law's obligations. These initiatives were beneficial not only for the environment but also for the airlines themselves. The airlines started introducing more efficient engines that produced fewer emissions. They also implemented noise-reduction technologies such as quieter engines and soundproofing materials in their cabins. Finally, they took the initiative to reduce bird strikes by installing radar systems that detect birds in flight paths and alert pilots of potential collisions. These initiatives have successfully reduced air travel's environmental impact, and helped make air travel more sustainable for future generations.

Scenario 2 (extrinsic): Imagine traveling with an airline whose aircraft' emissions, noise, and bird strikes lead to environmental degradation. The airlines realized that if they didn't take action to reduce their environmental impact, they would face severe consequences from governments and customers. So, they began implementing various initiatives to reduce their emissions, noise, and bird strikes. They invested in new technologies such as electric engines and quieter aircraft designs. They also implemented stricter regulations on fuel consumption and flight paths that would minimize bird strikes. These initiatives have positively impacted the environment, and have also benefited the airlines. By reducing their environmental impact, airlines have improved their public image, and attracted more environmentally conscious customers.

This study employed a scenario-based experiment to evaluate passengers' perceptions of airlines' environmental practices. This methodology allows for controlled manipulation of intrinsic and extrinsic motivations in a hypothetical setting. Two scenarios were developed based on examples of real-world airline sustainability initiatives. The first scenario detailed an airline voluntarily adopting emissions reductions, noise mitigation, and bird strike prevention out of authentic environmental concern. The second scenario described

an airline implementing the same initiatives due to government regulations and reputation management. The scenarios were refined through the input of experts to ensure credibility.

Participants with past airline experience were presented these scenarios in a counterbalanced order. They then rated their intentions to use and recommend the airline on established scales. This experimental design isolates the effect of intrinsic versus extrinsic motivations on passenger attitudes. While hypothetical, the scenario-based approach enables direct comparison between conditions while ensuring participant blinding to the study aims. The controlled setting improves internal validity relative to observational field studies. The findings provide an initial understanding of how intrinsic and extrinsic framing affects customers' perceptions of sustainability practices. Further research can build on these results to evaluate responses to actual airline initiatives. Overall, the scenario methodology balances experimental control with ecological validity to address the research questions.

We then developed two constructs—see Table 1—(passengers' intentions to use airlines and their intention to recommend them) that measure passengers' perceptions of airlines. Then, we applied both constructs to the two scenarios to measure passengers' perception with the intrinsic versus extrinsic airline environmental campaigns. We adopted four items from Saleh [41] for passengers' word of mouth and four items for passengers' intention to use from Rifkin et al. [40] and Suki and Suki [44].

Table 1. Construct measures.

Construct	Items	Cronbach Alpha (CA)	Composite Reliability (CR)	Average Variance Extracted (AVE)
Intention to use (For the first scenario)	I will use this airline for my next trips. Using this airline to fly with is something I would do. I used to see myself using an airline ticket for that airline. I tend to use these airlines giving preference over others.	0.80	0.74	0.54
Airline recommendation (For the first scenario)	I am going to recommend the airline to my friends and family. I “talk up” about the airline to my friends. I am going to spread the good word about the airline. I am going to recommend the airline to lots of people.	0.87	0.85	0.56
Intention to use (For the second scenario)	I will use this airline for my next trips. Using this airline to fly with is something I would do. I used to see myself using an airline ticket for that airline. I tend to use these airlines giving preference over others.	0.85	0.77	0.51
Airline recommendation (For the second scenario)	I am going to recommend the airline to my friends and family. I “talk up” about the airline to my friends. I am going to spread the good word about the airline. I am going to recommend the airline to lots of people.	0.79	0.86	0.60

3.2. Data Collection

The study sample was selected through a three-stage process involving students. Initially, strict criteria were established to ensure the appropriateness of the sample. Specifi-

cally, participants were required to possess knowledge of firms' environmental assumptions, and were informed about this study's objectives as outlined in the current literature [42]. In the first selection stage, students from relevant programs were identified based on their prior coursework and experiences related to corporate sustainability. Only those students were considered who had travel experiences via airlines and were enrolled in business, environmental science, or public policy programs. Within these programs, students in their third or fourth year of study were prioritized to ensure sufficient exposure to the relevant topics. Students were apprised of the research scope and criteria in the second stage. Selected students were contacted via email and were invited to participate. The invitation outlined the purpose of this study, the time commitment involved, and the general nature of the scenarios. Students were asked to respond if they met the criteria and were willing to participate. This allowed for the self-selection of participants who believed that they possessed the requisite knowledge and interest in the research area. Finally, participants were presented with two scenarios and ensured comprehension before responding—the scenarios aimed to test students' perceptions of firm legitimacy following different environmental initiatives. Students were first asked a series of verification questions to ensure that they correctly understood the scenarios and critical concepts [43]. Those who could not correctly answer most verification questions were excluded from participation.

The scenarios were distributed online in January 2023 to ensure the efficient application of criteria. Following data collection, analysis commenced, resulting in 503 students who met these criteria volunteering to participate in this scenario-based experiment. Overall, the multi-stage selection process aimed to identify participants with sufficient knowledge of the issues under examination while maximizing the sample size through a self-selection element.

4. Results

4.1. Sample Profile

The given sample profile (Table 2) provides a comprehensive breakdown of the demographic characteristics of the participants in this study. This study included 503 students, of which 60.2% were female and 39.8% were male. The age distribution of the participants indicates that the majority of participants fell within the age bracket of 18 to 35 years, constituting 72.5% of the sample. The remaining 27.5% participants were divided between the age brackets of 36 to 45 years and 46 years and over, representing 15.1% and 12.4%, respectively. Regarding educational qualifications, a large proportion of participants, 77%, held a Licentiate or bachelor's degree, while 17.2% possessed a master's degree, and only 5.8% had a Doctorate Degree. Understanding the sample profile is critical in determining how representative the sample is of the population under investigation. It also provides insights into the potential demographic of study findings.

Table 2. Participants' profile.

Parameter	Category	Number	Percentage
Gender	Males	201	39.8%
	Females	302	60.2%
Age	18 to 35 years	365	72.5%
	36 to 45 years	76	15.1%
	46 years and above	62	12.4%
Education	Licentiate/Bachelor	387	77%
	Master's degree	87	17.2%
	Doctorate Degree	29	5.8%

4.2. This Study's Reliability and Validity

The researchers studied the results' reliability of the composite construct using the composite reliability (CR) and Cronbach Alpha (CA) coefficients to measure reliability. The results in Table 2 show that constructs with Cronbach's Alpha values between 0.79 and

0.90 were higher than the advised threshold point of 0.70 [45]. The constructs' composite reliability also exceeded the suggested threshold of 0.70, ranging from 0.82 to 0.88 [45,46]. As a result, the findings show that each construct of the numerous items can be measured with sufficient internal consistency. Also, we measured the convergent validity to examine how items were related to their corresponding constructs. The average variance extracted (AVE) values for both constructs ranged from 0.55 to 0.067, and the composite reliability (CR) was higher than 0.70 (see Table 1), exceeding the 0.500 threshold value for AVE and 0.70 for CR [47], indicating convergent validity of the measurement items.

4.3. A Paired Sample *t*-Test to Measure the Difference between Scenarios

These results support the notion that intrinsic environmental practices promote positive attitudes and behaviors among passengers more effectively than external practices, suggesting that airlines should prioritize intrinsic environmental practices, such as green and sustainable policies, reflecting the airlines' commitment to protecting the environment (Table 3). These findings are consistent with research that shows how intrinsic motivations can create long-lasting behavioral changes, as they appeal to individuals' internal values and beliefs rather than extrinsic rewards or punishments.

Table 3. The mean differences.

		Intrinsic	Extrinsic
Intention to use	Mean Sig.	4.20 0.001 ***	1.79
Airline recommendation	Mean Sig.	3.53 0.000 ***	2.46

*** Statistically significant at $p < 0.01$.

5. Discussion and Conclusions

Airline initiatives to preserve the environment from the negative impacts of emissions, noise, and bird strikes have been recognized as a force-carrying managerial tool to achieve a win-win situation for both an airline's image and passengers' perceptions toward them [8]. For the airline's image, airlines impose regulations and follow formal aviation regulations to enhance their environmental practices to preserve the environment, enhancing their reputation and image [9]. For passengers, previous research approved that passengers have positive perceptions toward airlines that engage in initiatives that preserve the environment, leading to more satisfaction toward these airlines [10]. However, our research goes beyond the current literature debate by providing how the attribution toward the airline's initiatives, for example, the internal attribution (intrinsic) compared with external attribution (extrinsic) of the airline's initiatives toward the environment, can impact travelers' intention to use airlines and their willingness to recommend it. Extrinsic environmental practices are implemented in response to outside organizations' demands and expectations, while intrinsic environmental practices refer to a company's internal values and traditions [48,49].

Our study results imply that environmentally concerned travelers are more likely to fly with airlines that prioritize sustainability as part of their internal principles and culture [10]. In contrast, our study results demonstrated that passengers do not prefer to fly with airlines that follow extrinsic rather than intrinsic environmental practices in terms of environmental protection. Extrinsic environmental practices pertain to the image that an airline presents itself to the public through marketing campaigns and charitable endeavors. The study results are consistent with the previous research, which has demonstrated that passengers are more inclined to select airlines that are consistent with their values and views [50]. This would imply that passengers who value environmental initiatives about airline emissions, noise, and bird strikes as internal initiatives from airlines to fix these environmental problems will have positive behavioral outcomes toward these airlines [8]. When passengers have positive behavioral outcomes toward airlines, they are likely to use them and fly with them to different destinations [50–53]. That is the reason our study

found that travelers seek to use airlines whose environmental initiatives are implied to be for internal reasons rather than external obligations.

Moreover, according to our research results, passengers who believe that their airline has intrinsic environmental measures are more inclined to spread positive word of mouth and suggest it to others. Passengers are more likely to see an airline favorably. They feel good talking about airlines to their peers when they believe that the airline is genuinely devoted to minimizing its environmental impact [9]. Passengers are more likely to advocate for the airline, so that this favorable view may promote loyalty and advocacy [8]. This study also shows that passengers have strong positive word of mouth when they have perceptions that the airline sincerely cares about the environment by its intrinsic tendency compared with external environmental tendency [39,40,54]. The success and reputation of an airline can be significantly impacted by positive word-of-mouth recommendations from passengers [55]. Customers who have a good experience with an airline are likelier to tell their friends and family about it [56]. Positive word of mouth can increase customer loyalty, brand recognition for the airline, and revenue [54]. Thus, our research on passengers' perceptions toward airlines' intrinsic and extrinsic environmental initiatives has yielded significant theoretical contributions and managerial implications. These findings have important implications for airline managers who seek to create a positive brand image as well as to attract environmentally conscious passengers.

The current study has manifold theoretical contributions. Our study contributes to the existing literature by examining the impact of intrinsic and extrinsic airline initiatives on passengers' behaviors regarding the intention to use the airlines and word of mouth. Furthermore, our study highlights the importance of understanding the attribution made by passengers toward an airline's environmental initiatives. This is significant for airlines that want to improve their reputation and achieve a win-win situation with their passengers. Our research findings suggest that airlines prioritizing sustainability as part of their internal principles and culture are more likely to attract environmentally concerned passengers.

In contrast, airlines that primarily implement extrinsic environmental practices rather than intrinsic values may not be perceived as sincere, and may not be preferred by passengers. The study results imply that the positive impact of airline initiatives on passengers' behavior may depend on the attribution made by travelers concerning the motivation underlying these initiatives. Therefore, the current study contributes to the recent studies studying passengers' word of mouth (e.g., Wang et al. [54]; Rifkin et al. [40]; Nguyen-Phuoc et al. [39]; Boubker and Naoui, [56]) and passengers' intention to use airlines (e.g., Waung et al. [50]; Pan and Truong, [51]) by shedding light on the intrinsic environmental initiatives as stimulated for both passengers' word of mouth and intention to use the airlines. Moreover, it contributes to the literature on passengers' perceptions of airline environmental protection efforts (e.g., Okumus et al. [10]; Wong, [9]) by adding intrinsic and extrinsic environmental initiatives to predict passengers' behavior, leading to crucial managerial implications.

The current study's findings have critical managerial implications for airlines looking to improve their reputation as well as to achieve a win-win situation with their passengers. First, airlines must prioritize sustainability as part of their internal principles and culture to attract environmentally concerned passengers. For instance, airlines can invest in developing sustainability strategies that align with their vision, goals, and values. This may include the use of biofuels or reducing carbon emissions through the adoption of modern aircraft technologies. By prioritizing sustainability, airlines can differentiate themselves from competitors and attract passengers who value environmentally friendly travel. Second, airlines must communicate their intrinsic environmental initiatives to passengers to promote positive word-of-mouth recommendations and increase passengers' intentions to use their airline. For example, airlines could include information about their environmental initiatives in their marketing campaigns, or provide passengers with sustainable travel options through their online booking systems. Airlines can create a strong brand image that aligns with passengers' values and beliefs by communicating their intrinsic environmental initiatives to passengers.

Third, airlines must understand the attribution made by passengers toward their environmental initiatives to determine how to position themselves to passengers. If passengers perceive an airline's environmental initiatives as purely external, such as those only implemented in response to outside organizations' demands and expectations, this may not be seen as sincere, and may not be preferred by passengers. However, if passengers perceive an airline's environmental initiatives as intrinsic, implemented as part of the company's internal values and traditions, passengers are more likely to see the airlines as sincere and prefer them. Therefore, airlines must develop intrinsic environmental initiatives that align with their internal values and traditions to position themselves as environmentally friendly and honest. In summary, the current study's theoretical contributions and managerial implications highlight the importance of airlines prioritizing intrinsic environmental initiatives to create a strong brand image among environmentally concerned passengers. By communicating these intrinsic initiatives and understanding passengers' attributions, airlines can improve their reputation, increase passengers' intentions to use their airline, and promote positive word-of-mouth recommendations.

6. Limitations and Future Research

This research has several limitations. First, the current study used a student sample for the scenario-based experiment. Although university students frequently travel via airline, they may not accurately represent the broader population, limiting the generalizability of the study findings to other populations. Future research may include more diverse samples, such as working professionals or frequent flyers, to confirm the generalizability of the study findings. Another limitation is using scenarios to measure passengers' intentions and word-of-mouth recommendations. Scenarios help explore hypothetical situations, but may not always reflect real-world experiences. In addition, the two scenarios provided to participants may not have represented the full range of possible airline environmental initiatives. As a reviewer recommended, future research could incorporate additional scenarios to provide a more comprehensive understanding of this topic. More realistic measures could also be used, such as evaluations of actual airline environmental practices, customer feedback, or ratings from independent organizations.

Furthermore, the current study only examines the impact of intrinsic and extrinsic environmental practices on passengers' behavior. Other factors, such as cost, service quality, and flight convenience, may also influence passengers' decisions and recommendations. Therefore, as the reviewer noted, future research should incorporate additional variables to better understand the complexity of airline passengers' behavior. Expanding the scenarios and factors examined would provide greater insight into this multifaceted issue. Overall, while this study provides an initial look at passengers' perspectives, further research is needed with broader samples, real-world stimuli, and consideration of other relevant variables.

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