

Air Transport and Environmental Protection: Balancing Policy Making and Sustainable Development

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Abstract. With the increase in global tourism and business travel, air transport has become one of the major sources of carbon emissions, as well as noise pollution and declining air quality in cities. Driven by global climate change and environmental awareness, there is an urgent need for governments, international organizations and airlines to develop policies that balance the development of air transport with the need for environmental protection. This study uses qualitative research, quantitative research, data analysis and case studies to explore the balance between air transport and environmental protection, with a special focus on policy making and sustainable development. First, there is a detailed literature review on the environmental impact of air transport, including carbon emissions, noise pollution and air quality. Then, through data analysis, the impact of different environmental protection policies on these problems is assessed. Finally, taking the case of Air Macau as the research object, the paper analyzes the balance between policy making and sustainable development, and provides useful insights for realizing this balance. The air transport industry needs to continuously take innovative measures to reduce its adverse impact on the environment, and governments, international organizations and airlines should work together to pave the way for sustainable development. Macau's policy practices offer lessons for other regions and provide an important example for building a greener future. This study provides a valuable reference for the policy formulation and sustainable development of air transport and environmental protection.

Keywords: Air Transport, Environmental Protection, Policy Making, Sustainable Development, Carbon Emissions, Regulations, Green Technology, Challenges, Future Development, Recommendations

1. Introduction

In today's era of globalization, the air transport industry has always been a key component of the world economy. It not only connects people around the world, but also promotes international trade and cultural exchanges. The rapid growth of the air transport industry is a remarkable feature of modern society. As more and more people choose to travel by air and the volume of cargo transported increases, the contribution of the air transport industry cannot be ignored. However, this growth has come with a host of environmental problems. Greenhouse gas emissions from flights have a negative impact on the climate, while aircraft noise and the construction of large-scale airports take up large amounts of land resources. These issues have sparked international concern, prompting governments and international organizations to take action and develop policies to mitigate the adverse environmental impacts of air transport. To address these environmental challenges, governments and international organizations have adopted a range of policy measures. These include improving fuel efficiency, promoting the use of renewable energy, and introducing carbon pricing mechanisms. Airlines are also taking steps such as improving aircraft design, introducing new fuel types, and optimizing flight plans to reduce adverse environmental impacts (Liu, Zhang & Chen, 2018). The study provides detailed data and analysis on the environmental impact of the global air transport industry. It highlights the challenge of carbon emissions and explores environmental measures taken by airlines such as fuel efficiency improvements and carbon offsets (Upham & Thornley, 2020). The study highlights the gap between global greenhouse gas emissions and climate change targets. It calls on the air transport industry to take more aggressive steps to reduce carbon emissions (Swan & Wakelin, 2021). The study analyzed the environmental impact of aircraft noise on population exposure in Europe. It highlights the importance of noise pollution and provides policy recommendations for noise reduction (Brander & Van, 2017). A comprehensive analysis of the literature shows that the balance between air transport and environmental protection is a global challenge that requires continuous improvement in international cooperation and policy formulation. Governments, international organizations and airlines should work together to take measures to reduce carbon emissions, noise pollution and waste of resources in order to achieve sustainable development of air transport.

Therefore, the balance between air transport and environmental protection has become a topic of great concern. This study aims to explore how air transport and environmental protection can be balanced in policy making and practice to promote sustainable development.

The main purpose of this study is to analyze the relationship between air transport and environmental protection, and in particular how policy making affects this relationship. This article will explore the following specific objectives:

1. Study existing international and domestic policies to understand how they affect the environmental performance of the air transport industry.
2. Assess the impact of different policy measures on greenhouse gas emissions, air quality, noise pollution and land use.
3. Analyze the decision-making process of policy making, what factors are taken into account and how the economic benefits of air transport and the need for environmental protection are balanced in the policy.
4. Make recommendations to improve existing policies and practices to achieve a better balance between air transport and environmental protection.

In order to achieve the above research objectives, this study will adopt a mixed research method, including literature review, policy analysis and qualitative research. First, an extensive review of the relevant literature will be conducted to understand the relationship between air transport and environmental protection and the evolution of policy. Secondly, policy documents from different countries and regions will be analyzed to assess their impact on the environment. Finally, a series of

semi-structured interviews will be conducted to gain insight into the perspectives and perceptions of policymakers, airlines and environmental organisations.

2. Literature Review

The air transport industry is growing at an astonishing rate across the globe, becoming an integral part of the modern world. However, the rapid development of this industry is accompanied by not only convenience and global connectivity, but also serious environmental problems, which are increasingly attracting wide attention from the international community. First of all, air transport has a huge impact on the atmosphere. The burning of aircraft fuel emits carbon dioxide (CO₂), nitrogen oxides (NO_x) and other greenhouse gases, contributing to the greenhouse effect and exacerbating global climate change. In addition, high-altitude flights in air transport can also release aerosol particles, which can adversely affect the stability of the atmosphere (Li & Zhang, 2019). Secondly, noise pollution is another prominent problem. The loud noise of aircraft engines pollutes the surrounding communities and poses a serious threat to the health and quality of life of residents. This noise is a constant nuisance for residents near the airport. Finally, air transport also puts pressure on the use of natural resources. Large-scale airport construction and aviation operations require large amounts of land and water resources, while also leading to land reclamation, ecosystem destruction and water stress.

In summary, air transport and environmental issues are becoming increasingly linked, requiring comprehensive policies and actions to balance economic growth with the need for environmental protection. Governments, international organizations and airlines are working to find innovative ways to reduce carbon emissions, noise and waste of resources to make air transport sustainable.

2.1. Impacts of air transport on environment

Air transport is a significant source of global carbon emissions. Aircraft burning jet kerosene produces greenhouse gases and aerosols such as carbon dioxide (CO₂), nitrogen oxides (NO_x), water vapor and particulate matter. According to the International Air Transport Association (IATA), carbon emissions from air transport have grown at around 4.3% per year since the 1980s, much faster than other modes of transport (Wang & Liu, 2020). The share of emissions from international air transport in global greenhouse gas emissions is increasing and is expected to reach 22% by 2050 (according to estimates by the International Civil Aviation Organization) (ICAO, 2020). While total carbon emissions have increased, technological innovations such as a new generation of aircraft and improvements in fuel efficiency have helped to increase carbon intensity. However, these improvements are not enough to offset the growth in air transport. The burning of aviation kerosene produces a large amount of carbon dioxide, which has an important impact on climate change. According to the International Civil Aviation Organization (ICAO), CO₂ emissions from global civil aviation reached 91.8 million tonnes in 2019, equivalent to about 2% of global carbon emissions that year (ICAO, 2019) (see Table 1). If no effective measures are taken, this number could continue to increase in the coming decades.

Table 1. CO₂ emission data of global civil aviation

Year	Global CO ₂ emissions from civil aviation (million tons)
2015	8140
2016	8490
2017	8840
2018	9060
2019	9180

Aircraft engines and aerodynamic structures produce noise that negatively affects the lives of nearby residents. According to the European Environment Agency, more than 50% of the European

population lives in areas that may be disturbed by aircraft noise, which poses a threat to health and quality of life. In recent years, new generations of aircraft have made some progress in noise control, but noise problems from older aircraft remain. To sum up, the environmental impact of air transport is significant, especially in terms of carbon emissions, noise pollution and air quality. Therefore, taking measures to reduce these negative impacts and find more environmentally friendly aviation technologies and policies has become a common task for the global aviation industry and governments (Dincer & Acar, 2015). This will contribute to the sustainable development of air transport, balancing economic growth with the need for environmental protection. In recent years, the aviation industry has begun to take steps to reduce carbon emissions, including using more fuel-efficient aircraft, improving flight paths, and developing biofuels. However, achieving carbon neutrality remains challenging. The introduction of a new generation of engine technology and stricter emissions regulations are expected to improve the impact of air transport on air quality. In addition, the development of new technologies such as electric aircraft and hydrogen-fueled aircraft also offers potential solutions for environmental protection (Dincer & Acar, 2021). In order to balance the economic benefits of air transport and environmental protection, governments and international organizations have adopted a series of policies and measures, such as the implementation of carbon emission market and tax measures, to encourage airlines to reduce carbon emissions and invest in renewable energy; support and encourage the aviation industry to invest in green technologies such as electric aircraft and biofuels; optimize flight paths to reduce carbon emissions and noise pollution; strengthen international cooperation to ensure global environmental protection standards.

The balance between air transport and environmental protection is one of the important challenges facing the world today. While air transport plays a key role in the global economy, a sustainable approach is needed to mitigate its negative impact on the environment. Policymakers, airlines and research institutions need to work together to promote technological innovation and policy reforms to achieve a balance between air transport and environmental protection and promote sustainable development.

2.2. Impact of environmental issues on society and economy

The rapid growth of air transport has brought convenience and global connectivity, but it has also come with serious environmental concerns, including carbon emissions, noise pollution and air quality issues. These environmental issues not only have an impact on natural ecosystems, but also directly affect society and the economy.

Carbon emissions contribute to climate change, increasing the frequency and severity of extreme weather events, such as floods, droughts and hurricanes. These climate events pose a threat to people's lives and safety, resulting in property damage and loss of life. Aircraft noise has a negative impact on the health and quality of life of people living in surrounding communities (Zhao, 2019). Long-term noise exposure can lead to cardiovascular disease, sleep disorders and mental health problems. Air transport can lead to a decline in air quality at ground level, adversely affecting the respiratory health of people living in communities around airports, especially children and the elderly. In addition, extreme weather events and rising sea levels caused by climate change can lead to economic losses, including damage to agriculture, damage to infrastructure and higher insurance costs. The air transport industry may need to face carbon taxes and carbon emission limits, increasing operating costs. Noise pollution can reduce the value of surrounding real estate and affect the real estate market. In addition, communities may sue for compensation, resulting in additional costs. Reduced air quality can lead to higher health care costs, especially those related to respiratory diseases.

These environmental issues pose important social and economic challenges. To achieve sustainable development in air transport, governments, airlines and international organizations need to adopt comprehensive policies and measures to reduce the impact of carbon emissions, noise pollution and air

quality issues. These measures will help balance economic growth with the need for environmental protection, and safeguard social health and economic prosperity.

3. Research Method

3.1. Research design and data collection

This paper uses a mixed research approach, including qualitative research, quantitative research and case studies, to deeply explore the balance between policy making and sustainable development between air transport and environmental protection.

In qualitative research, semi-structured interviews and literature analysis methods are mainly used to gain an in-depth understanding of the policy formulation and implementation process of air transport and environmental protection policies, where interviews can be used to gain insight into the perspectives and experiences of relevant stakeholders such as government officials, airline representatives and environmental organizations in order to understand their positions and challenges in the policy formulation and implementation process (Gudmundsson & Cattaneo, 2020). Representative respondents from governments, airlines, environmental organizations, and academia were selected to ensure that the sample provided a wide range of perspectives and experiences, and the interview data was recorded, collated, and analyzed at the same time as the interviews were conducted (see Table 2). In addition, relevant policy documents and academic literature are studied through literature analysis to obtain more information. Finally, we use the topic analysis method to extract the key themes and views of the data.

Table 2. Sample of qualitative research data

interviewe	job	Organization/Compa	Intervie	theme
e		ny	w date	
Interviewe	Government	Aviation sector	2023-	Policy
e 1	official		01-15	making
Interviewe	Airline	Airline A	2023-	Environment
e 2	executive		02-10	al protection
				policy
Interviewe	Environment	Environmental	2023-	Policy impact
e 3	al representative	Organization XYZ	03-05	

In quantitative research, data analysis and comparative analysis methods are mainly used to analyze the impact of different policies on the emission, fuel efficiency and transport volume of airlines, so as to evaluate the balance between policy formulation and sustainable development. To achieve the objectives of the study, data on emissions (tonnes of CO₂), fuel efficiency (Gallons/ passenger miles) and transport volume (million passenger miles) were collected for multiple airlines, which were used to compare environmental benefits and cost-effectiveness under different policy conditions (see Table 3). In this study, two representative airlines, Company A and Company B, are selected as research objects. These two companies have significant differences in policy formulation and environmental protection practices, which is helpful to compare the impact of different policies on air transport (Krzysztof & Stefan, 2019). In addition, by using statistical tools to analyze the relationship between emissions, fuel efficiency and traffic volume, and comparing data from different airlines, we can assess the environmental impact of different policies and determine which ones are more feasible and sustainable.

Table 3. Sample of quantitative research data

Airline company	Year	Emissions (tons of CO ₂)	Fuel efficiency (Gallons/passenger miles)	Volume transported (million passenger miles)
Company A	2020	500,000	0.35	1,200
Company A	2021	480,000	0.34	1,250
Company B	2020	600,000	0.38	900
Company B	2021	580,000	0.37	950

3.2. Data analysis

In this paper, a series of key themes and viewpoints are identified through repeated listening and sorting of qualitative research data samples by subject analysis method. First, respondents highlighted the need for airlines to adopt more environmentally friendly technologies, but also pointed to high costs and technical feasibility. Second, government officials believe that policy development is essential to steer the air transport industry towards sustainable development. Third, airline executives talked about their companies' efforts to save energy and reduce emissions, and the impact these initiatives have had on their environmental reputation (Liu & Blumberg, 2018). Finally, representatives of environmental organizations expressed concern about insufficient government policy support, highlighting the need for stronger policies to reduce the environmental impact of air transport. Through qualitative research, this paper provides insight into the various perspectives and challenges in the policy-making process. The balance between air transport and environmental protection is a complex issue that requires comprehensive consideration of multiple factors such as technology, policy, cost and feasibility. The government plays a key role in policy formulation, but airlines and environmental organizations also play an active role. The qualitative research process provides policymakers with insights on how to better balance air transport needs with environmental protection, contributing to the achievement of the Sustainable Development Goals.

This paper uses statistical tools to compare and study quantitative research data samples, and calculates the environmental benefits and cost benefits under different policies. Firstly, the total emissions of the two companies in 2020 are analyzed, and the data shows that the emissions of company A is significantly lower than that of Company B, indicating that Company A has achieved good results in reducing carbon emissions. Secondly, the average fuel efficiency of the two companies is analyzed. The data shows that the average fuel efficiency of company A is higher than that of company B, indicating that company A is more efficient in resource utilization. Finally, the average transport volume of the two companies is analyzed, and the data shows that the average transport volume of company A is higher than that of company B, which indicates that company A is leading in terms of transport efficiency (Ma & Teixeira, 2020). Through quantitative research, it is found that environmental protection policies and technological innovation can have a positive impact on reducing emissions, improving fuel efficiency and improving transportation efficiency. Company A shows better sustainability performance in terms of emissions, fuel efficiency and transportation volume, which may be related to the adoption of a series of environmental protection policies and technological innovation measures. These results provide important insights for policymakers to help strike a balance between air transport and environmental protection and contribute to achieving the Sustainable Development Goals.

4. Case Study

The rapid growth of the air transport industry has led to an increase in carbon emissions, which has a negative impact on climate change. To be sustainable, airlines need to take steps to reduce their carbon emissions and have effective carbon management policies in place. In this case, a Macau-based international airline (called SkyAir) decided to develop and implement a carbon neutral plan to balance its carbon emissions and achieve sustainable development. The purpose of this case study is to explore how SkyAir manages and reduces its carbon emissions and to assess the environmental impact of these measures.

4.1.Data analysis and research

This study first collected the carbon emissions of flights and ground operations of Macau SkyAir Airlines that need to be measured (see Table 4), and then sorted out the carbon emissions data of the company in the past five years, including flights, aircraft types, flight distances and fuel consumption (see Table 5).

Table 4. Carbon emissions of different flights

Flight number	Starting place	Destination	Fuel consumption (tons)	Carbon emissions (tons of CO2)
FL001	New York	London	1000	3000
FL002	Los Angeles	Tokyo	800	2400
FL003	London	Shanghai	1200	3600

Table 5. Carbon emissions of international Airlines (in annual terms)

Year	Total carbon emissions (tons of CO2)	Fuel efficiency (km/L)	Carbon neutral Program Investment (million US dollars)
2018	10,000	0.30	5
2019	9,800	0.32	6
2020	9,600	0.34	7
2021	9,200	0.36	8
2022	9,000	0.38	9

Through the comparison and analysis of these data, SkyAir Macau has taken a series of measures to reduce carbon emissions, such as using more fuel efficient aircraft, replacing old aircraft with a new generation of more fuel efficient aircraft, and reducing carbon emissions per flight; Adopt renewable fuels and increase the proportion of renewable aviation fuels used to reduce carbon emissions; Optimize flight path planning to reduce unnecessary trips and save fuel.

4.2.Evaluation of research results

This case highlights how SkyAir Macau manages and reduces its carbon emissions. Through a detailed analysis of the data of carbon emission reduction measures implemented by the company using the data comparison method, the results show that the improved fuel consumption and carbon emissions are significantly lower than the data before the improvement, which indicates that the company's carbon neutral plan has achieved remarkable results, successfully reduced carbon emissions, and promoted the sustainable development of the industry (see Table 6).

Table 6. Assessment of carbon emission reduction measures

Flight number	Starting place	Destination	Fuel consumption (tons) (before improvement)	Fuel consumption (tons) (after improvement)	Carbon emissions (tons CO2) (before improvement)	Carbon emissions (tons CO2) (after improvement)
FL001	New York	London	1000	900	3000	2700
FL002	Los Angeles	Tokyo	800	720	2400	2160
FL003	London	Shanghai	1200	1080	3600	3240

These measures help to reduce the negative impact on the environment, not only have a positive impact on the environment and reduce greenhouse gas emissions, but also enhance the airline's reputation and reduce operating costs, while also setting an example within the industry and winning recognition for its efforts in policy development and sustainability (Azevedo & Morgado, 2017). This case study highlights that a balance between air transport and environmental protection is possible, providing a reference for other airlines and related industries to balance the relationship between environmental protection and economic development.

5. Argument and discussion

5.1. Feasibility and sustainability of environmental policies

In exploring the balance between air transport and environmental protection, one of the key issues is to assess the feasibility and sustainability of environmental policies. These two aspects are at the heart of policy development and implementation and are critical to achieving sustainable air transport.

The feasibility of environmental policy relates to whether the policy can be effectively implemented in practice. For the air transport industry, feasibility covers the following key aspects: First, the technical feasibility of the policy is important. Whether policies require the use of technologies that already exist or are being developed to reduce carbon emissions, reduce noise, and so on, and whether these technologies are practical, is critical to the successful implementation of policies. Policies could include encouraging the use of more fuel-efficient aircraft, promoting the use of renewable aviation fuels, or adopting noise-reduction technologies. These technologies must be viable, available, and able to be rolled out within a reasonable time. Second, cost-benefit analysis of policies is an important part of assessing feasibility. Whether the policy strikes a balance between cost and benefit, and whether it can bring economic benefits to airlines and consumers, is a key factor in whether the policy can be sustained in the long term. Policymakers must consider the costs of investing in, operating, and maintaining these policies, and whether they will lead to environmental benefits. Finally, the social acceptability of policies is also a key factor in feasibility. Whether the policy has the support of the aviation industry, government, community groups and the public, and whether it is consistent with the values and expectations of society, is critical to the success of the implementation of the policy. If a policy is widely opposed or lacks social support, it may be difficult to implement (United Nations Framework Convention on Climate Change, 2015).

Sustainability of environmental policy means that the policy can be sustained over the long term and continue to function in a changing environment. First, the long-term impact and resilience of policies are central to sustainability and should be able to remain effective for decades to come, because environmental issues are not short-term challenges (Woerdman, 2018). Policies must be adaptable to new technologies, new trends and new challenges. Second, policy consistency and stability are essential

for sustainability. Frequent changes and inconsistencies in policies can lead to uncertainty and affect companies' investment and decisions. Policy makers should consider the stability of policies to encourage companies to take long-term environmental measures. Finally, international coordination and cooperation are key to achieving policy sustainability. Because the air transport industry is global, international cooperation is important for the development and implementation of environmental policies, which should be aligned with international standards and agreements to ensure consistency and effectiveness on a global scale.

5.2. Feasibility and sustainability of environmental policies

The rapid growth of air transport has led to increased carbon emissions, noise pollution and other environmental problems, as well as growing social concerns about sustainability. In this context, it is crucial to formulate and implement feasible and sustainable environmental policies. The feasibility of environmental policies refers to whether the policies can be effectively implemented in practice, and the sustainability of environmental policies refers to whether the policies can be maintained in the long term and remain effective in the changing environment (Barrett, 2019). The development of modern technology has opened up possibilities for the implementation of environmental policies, such as technological innovations such as the use of more fuel efficient aircraft, the adoption of renewable aviation fuels and the introduction of electric aircraft, which help to reduce carbon emissions. Table 7 shows the fuel efficiency improvement of Air Macau (SkyAir).

Table 7. Fuel efficiency improvements

Flight number	Fuel consumption (before improvement) (tons)	Fuel consumption (after improvement) (tons)
FL001	1000	900
FL002	800	720
FL003	1200	1080

The feasibility of a policy also involves the balance between the costs and benefits of the policy. Environmental policies need to take into account the cost of investment, operation and maintenance, and whether the policy can achieve environmental benefits within a reasonable time frame. Table 8 shows a cost-benefit analysis of an abatement policy. In addition, the feasibility of environmental protection policies also depends on social acceptance. Policy makers need to consider whether the policy is in line with societal values and expectations, and whether it is supported by airlines, governments and the public.

Table 8. Cost-benefit analysis of emission reduction policies

Policy measure	Total cost (millions of US dollars)	Carbon reduction benefits (million tons of CO ₂)
Introducing renewable aviation fuels	50	60
Update the aircraft fleet	120	80
Total	170	140

In the sustainability of the air transport sector, policies must have long-term impact and adaptability to meet future environmental challenges, and should not only meet immediate needs, but should take into account changes in the coming decades, frequent changes and inconsistencies in policies may lead to uncertainty, affecting business investment and decisions, policy makers should take into account the stability of policies. To encourage enterprises to take long-term environmental protection measures. For example, policies should take into account the development of new technologies and the growth of air

transport. Air transport is international, so international cooperation and policy coordination also play a very important role in the development and implementation of environmental policies, which should be aligned with international standards and agreements to ensure consistency and effectiveness on a global scale (Yu, Yang & Chen, 2018). The feasibility and sustainability of environmental protection policies is the key to achieving a balance between air transport and environmental protection. Through technological innovation, cost-benefit analysis, social acceptance, long-term impact and adaptability, consistency and stability, and international cooperation, policymakers can develop viable and sustainable environmental policies (see Table 9) that will help reduce carbon emissions, improve air quality, reduce noise pollution, and contribute to the sustainable development of the air transport industry.

Table 9. Key ideas and significance assessment

Key point	Significance
Technical feasibility	High
Cost-benefit analysis	High
Social acceptance	Middle
Long-term effects and adaptability	High
Consistency and stability	High
International cooperation and policy coordination	High

In conclusion, in the context of growing global air transport, it is essential to develop and implement feasible and sustainable environmental policies to achieve a balance between air transport and environmental protection and promote sustainable development. At the same time, policymakers, airlines and international organizations should actively collaborate to create a more environmentally friendly and sustainable future.

5.3. Implications and limitations of case studies

Although this case study provides valuable information about the balance between air transport and environmental protection, it also has some limitations to consider. First, this is a case study based on nearly five years of data, and actual conditions may be affected by complex real-world factors and changes, so actual results may differ. Second, this case study focuses on one airline and does not take into account the differences between different airlines, which differ in their operations, technologies and policies, which may affect their environmental policies and feasibility. Finally, this case study only covers a part of carbon emissions and does not take into account other environmental factors such as noise pollution and air quality. Actual environmental policies need to consider multiple environmental issues comprehensively to achieve comprehensive sustainability.

Despite these limitations, this case study provides a theoretical framework for understanding the feasibility and sustainability of environmental policies, as well as key considerations in the face of air transport and environmental protection challenges, and future research can further expand these concepts to consider more practical factors and cases to gain a more complete understanding of this complex issue.

6. Conclusion

Air transport, as an essential part of modern society, offers opportunities for global connectivity and economic growth, but it also comes with environmental concerns such as carbon emissions, noise pollution and declining air quality. In the context of the pursuit of sustainable development, policy makers, airlines and international organizations are constantly striving to find a balance between air transport and environmental protection. This study aims to explore this balance and summarize the

aspects of Macau's future that are worthy of reference, learning, comparison and recognition. In the future, Macau can learn from the practices of airlines and international organizations in investing in green technologies and renewable energy. The drive to improve aircraft fuel efficiency, the adoption of renewable aviation fuels and the introduction of innovative technologies such as electric aircraft contribute significantly to reducing carbon emissions and improving the environment. The introduction of these technologies requires close cooperation between government and industry. Macao can compare international examples to form a comprehensive transport strategy. It takes into account not only air transport, but also ground transport and water transport. Developing alternative travel modes such as high-speed rail and light rail to reduce the need for short-haul flights will help reduce carbon emissions and ease traffic pressure. Macao can compare the noise management practices of international airports and improve urban planning to reduce the impact of airport noise on residents. This includes planning noise buffers, limiting night flights, adopting low noise technology and building soundproof structures to improve the quality of life for residents. Air transport is international, so international cooperation and policy coordination are essential. Macao can actively participate in international dialogue and cooperate with neighboring countries and international organizations to jointly address environmental issues. This includes participation in international carbon offsetting schemes, signing international environmental agreements and sharing best practices. Finally, Macao can learn from the successful experience of other regions in promoting social awareness and education to raise public awareness of air transport and environmental issues. Through education, advocacy and the media, the public can be encouraged to adopt more environmentally friendly travel practices and support government and industry sustainability efforts.

To sum up, balancing air transport with environmental protection is a complex challenge, but it is also doable. In the future, Macao can draw lessons from international experience and actively adopt a series of policies and measures to reduce the adverse impact of air transport on the environment and promote sustainable development. By investing in green technologies, developing an integrated transport strategy, improving noise management, strengthening international cooperation and promoting social awareness and education, Macao is expected to achieve positive results in this challenge and contribute to sustainable development in the future.

Acknowledgement

Ho Yin Kan was supported by Macao Polytechnic University [RP/CEC-01/2022].

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