# Short Review on Taxation Action in the Sustainability of Green Airports

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## Nomenclature

| | |
|---|---|
| IPCC | Intergovernmental Panel on Climate Change |
| ICAO | International Civil Aviation Organization |
| IATA | International Air Transport Association |
| ACI | Airport Council International |
| SHGM | Civil Aviation General Directorate of Turkey |

## 1 Introduction

Today, climate change and global warming are common problems of all mankind and are problems that, by their very nature, require collective action in solving (Uysal, 2022). Emissions arise due to flight operations (Yu et al., 2019), and it has

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been proven by many studies that the aviation sector also has an undeniable impact on these problems (Ekici, 2020; Kayaalp et al., 2021; Timko et al., 2010; Wey et al., 2007). All aviation activities both affect and are affected by the environment (Öndeş, 2022). At this point, in addition to flight operations, airport's heating services, logistics, lighting needs, as well as the construction process are issues that need to be addressed in terms of sustainability (Ballini & Bozzo, 2015).

The concept of sustainability has been established at every stage of production over time and has gained a place in the aviation sector as well. At this point, the concept of "green airport" has become a prominent element in the aviation sector in terms of ensuring sustainability (Winter et al., 2021). Sustainable airport development brings positive external effects such as reduction of energy consumption, reduction of negative impacts on water and air quality, minimization of waste, and reduction of negative environmental impacts of airport construction (Boca Santa et al., 2020). These contributions become more valuable considering the negative effects of the sector on the environment.

According to the data announced at the Intergovernmental Panel on Climate Change (IPCC), 13% of greenhouse gas emissions, which have contributed significantly to global warming in the past half century, were announced to be caused by the aviation sector. These and similar published reports have shown again that green airports are the most logical choice for sustainable development (Xiong et al., 2022).

## 2 Green Airport Taxation

Under all these negative effects, the air transportation sector should act decisively to establish and maintain a balance between economic development, social progress, and environmental responsibility (three pillars of sustainability) by placing itself on a sustainable footing. Considering these reasons, instead of acting with the aim of uncontrolled capacity expansion, road maps that are sustainable and meet current needs without reducing the resources of future generations become a necessity, not a choice, when making plans for airports (SHGM, 2010). At this point, more and more airports have started to pay attention to the issue by placing the issue of sustainability at the focus point. Especially with the efficient use of resources, increasing the importance given to recycling and reducing waste, awareness has been established to protect the environment and ensure sustainability. The demand and support by consumers are other factors that force aviation businesses to be more sensitive (Korul, 2003) and aviation sector has become a part of this change with all its actors. Of the major organizations in the sector, Airports Council International (ACI) and the International Civil Aviation Organization (ICAO) work on common projects about green airports to create infrastructures that target the ecological planning in airports, to distribute land use plans based on this issue, and to form an appropriate system for airport managements. Currently, there are 400 airports around the world that are under construction or are making radical changes and infrastructure works to adapt to the green airport concept (Silva & Henkes, 2021). This change is more

**Table 1** Environmentally sensitive management versus traditional management

| | Traditional approach | Environmentally sensitive management |
|---|---|---|
| Aims | Economic growth, profit, increasing the wealth of share holders | Sustainability and quality of life, stakeholder welfare |
| Values | Human-centered | Bio-centered |
| Products | Products designed for function, style, and price | Environmentally friendly products |
| Production system | Energy-intensive production | Low energy and resource usage |
| Environment | Establishing dominance over the environment, accepting waste as output | Compliance with the environment, waste management |

Adapted from Shrivastava (1995)

clearly deciphered in Table 1, which shows the difference between today's environmentally sensitive management approach and traditional management approach. While in traditional management, there is a profit-oriented, human-centered, and environmentally oriented understanding, with the integration of the concept of sustainability into all areas of life over time, the environmentally friendly production management approach with an environmentally friendly, bio-centered structure has become a standard.

Today, green building applications are increasing at bio-center-oriented green airports operating with an environmentally sensitive management approach. Green building practices are contributing to the ecosystem by improving water quality, increasing biodiversity, conserving natural resources, and minimizing environmental effects such as alleviating negative consequences of global warming, reduction of operation and maintenance costs as well as economic performance, management approach, depending on today's environmentally conscious, eco-friendly service delivery, such as the realization of the economic and social impact in terms of sustainability is a topic that is supported by the authorities (Nilashi et al., 2015; Boca Santa et al., 2020).

Important environmental problems and the lack of natural resources have led humanity to an environmentally responsible consumption approach. Nowadays, more and more institutions have started to produce environmentally friendly products, and consumers have also increased the level of willingness to pay to purchase these products (Joshi & Rahman, 2015). There is a similar economic situation for green airports. However, in some cases, lack of environmental awareness pushes consumers to buy anti-environmental products. In such a situation, using financial instruments as an element of coercion emerges as an effective way to ensure the sustainability of green airports.

Decisively, the willingness to pay is a significant factor in the relationship between climate change and the goal of action (Winter et al., 2021). For this reason,

an effect that will create a change in willingness to pay can be achieved by taxation action.

In the case of imperfect competition between polluters, an optimal emission tax may be more costly than increasing environmental awareness (Abdul Baki & Marrouch, 2022). Therefore, tax is not the only way to ensure the sustainability of green airports. The main important point is to increase the awareness of individuals.

The Ramsey rule can be applied for long-haul flights at non-congested airports (Saremi et al., 2021). In this context, it is possible to suggest that the elasticity of demand for long-haul flights is low. If a higher tax is levied on long-haul flights for environmental sustainability at non-congested airports and a lower tax is levied on short-haul flights, both $CO_2$ emissions will be less, and tax revenue will be generated. The tax revenues collected can be used to maintain the effectiveness of green airports.

Specific and indirect taxes on tourism can internalize costs and provide improvements in terms of revenue without hindering the economy. However, indirect taxes are more applicable, fair, and impartial in the revenues that can be collected from tourism activities than specific taxes (Gago et al., 2009). Especially if it is considered in terms of charter flights applied by travel agencies, it is possible to suggest that indirect taxes can be applied at green airports and thus consumers' willingness to pay can be increased.

Carbon taxes are a very popular tax in reducing externalities. However, this type of taxes limits the willingness to pay. An air passenger tax that will be levied on first-class and long-haul flights instead of the carbon tax will further increase the willingness of passengers to pay (Seetaram et al., 2018). In this context, the collection of air passenger tax from first-class passengers of long-haul flights to green airports will be effective in maintaining the financing of green airports. Fig. 1 demonstrates green airports and taxation in a three logical dimensions.

The bonus/malus tax also has the potential to be effective in maintaining green airports. The bonus/malus tax has three types of effects (Hilton et al., 2014):

- In bonus/malus tax, rewarding one side creates a feeling of support, while punishing the other side can create a feeling of absence.
- Another effect that will arise in the implementation of the bonus/malus tax is as follows: While some behaviors are desired by society, some behaviors may not be desired by society.
- If the bonus/malus tax is perceived as an interventionist tax, crowding out effect may occur.

The application of a bonus/malus tax in the financing of green airports may limit the willingness to pay for certain parts of society. The person who is penalized in this system feels psychologically excluded from the services offered by green airports. The reason for this situation is since the services are supplied by private sector.

Environmental awareness is also important in the sustainability of green airports. If the environmental sensitivity of the society is high, the application of the bonus/malus system may be considered appropriate by the society. However, it is not possible to state that societies that have not yet been able to meet their basic needs

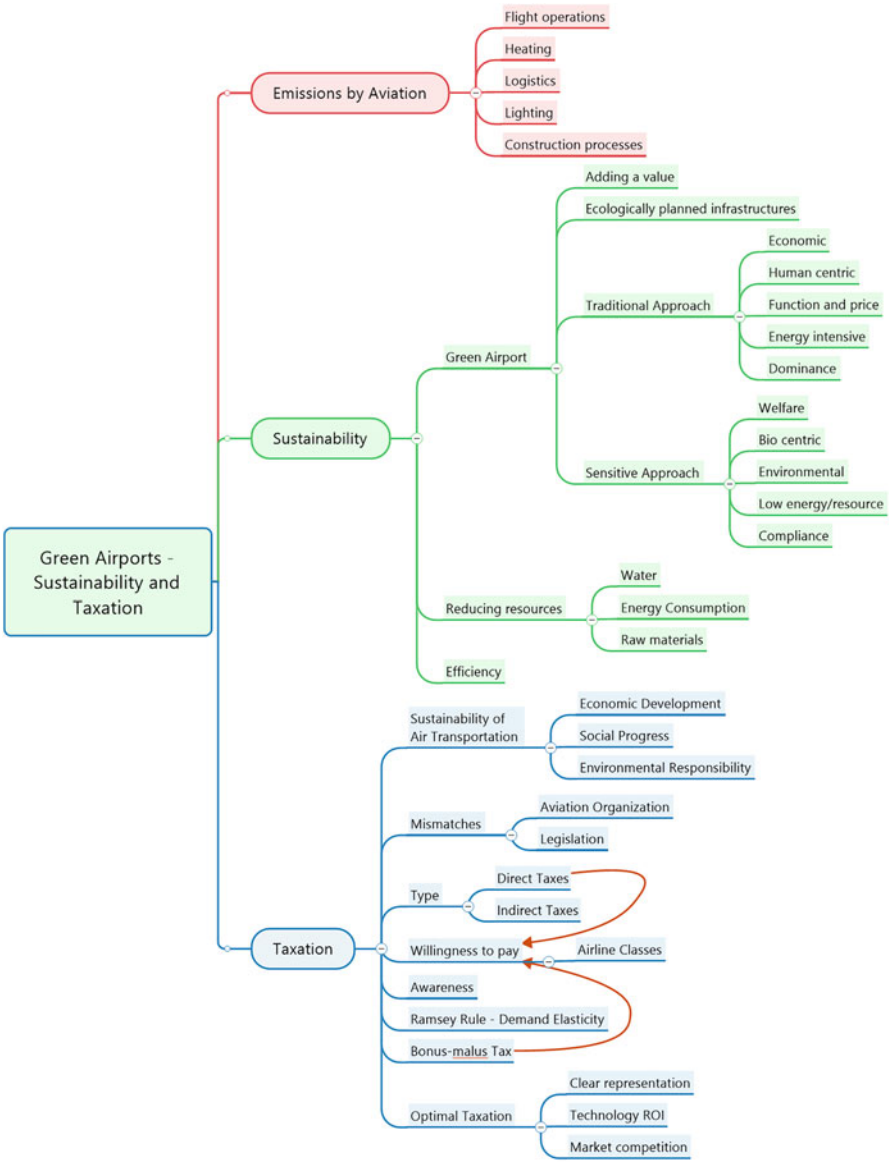


**Fig. 1** Green airports, sustainability, and taxation

will reasonably meet the implementation of such a system. Therefore, it is possible to encounter a tax refusal.

There may be an exclusion of the private sector from the market in bonus/malus tax. In the application of bonus/malus tax, which will be used as a financing tool to ensure the sustainability of green airports, the penalty increases the investment costs

of the private sector. In such a situation, the private sector stops investing, and the presence of the state becomes more felt in the market.

The effects of certain taxes on emissions may differ from each other due to the legislation of countries (Dube & Nhamo, 2019; Hájek et al., 2021). In determining the criteria related to green airports, these legislative differences may create uncertainty in whether the effects that will arise in the presence of an emission tax will be positive or negative. For instance, because of flights between the green airports of the two countries where the emission tax is applied, it is possible that the problem of double taxation may arise. In this context, the harmonization of the legislations can eliminate the problem of double taxation and thus increase the willingness of consumers to pay. With the increase in willingness to pay, pricing and financing will also increase in ensuring the sustainability of green airports.

Traditional measures aimed at excessive tax burden do not seriously address the real loss of effectiveness of taxation (Driffill & Rosen, 1983). For this reason, an optimal taxation is necessary to maintain the effectiveness of green airports.

## 3 Conclusions

Three elements are important in optimal taxation. The first of these is the clear representation of individual preferences, technology with a fixed return on scale, and a market where there is full competition. The second is related to the fact that the government should increase revenues by a fixed amount with a limited number of tax tools managed in a cost-free manner. The third is related to the existence of a criterion function that ranks the results. In this way, the best (optimal) tax system is selected in a limited set of tax tools. The focus is primarily on minimizing the loss of efficiency in the resulting optimal taxation preference. Then, it is discussed how the selected tax system affects the welfare distribution and how the efficiency loss should be balanced because of this distribution (Slemrod, 1990). In this context, it can be suggested that the following considerations should be taken while taking taxation action to ensure the sustainability of green airports:

- First, a taxation that will increase the willingness to pay should be carried out.
- The goods and services to be offered at green airports should be realized in accordance with consumer preferences. In this way, the revenue potential will be created, which will form a justification for taxation.
- All income-generating elements that will operate at green airports should be produced as much as possible under the conditions of a free market economy.
- It is necessary to adjust the use of technology at green airports in such a way as to provide at least according to constant returns to scale.
- Taxation is levied by the states. For this reason, the tax tools to be used by the states for sustainability in green airports should be both limited and generate revenue.

- The tax revenues generated in this way can be used by the states to finance green airports.
- Because taxes are collected from individuals and households, social welfare is affected by the act of taxation. Therefore, a balance should be achieved between the tax system to be chosen and social welfare.
- The loss of efficiency in the tax system to be selected for the financing of green airports should be minimal.
- It should not be enough just to choose a tax system. In addition, public awareness should be increased about the importance of green airports.
- In the tax system to be selected, the tax rates for long-haul flights should be high. To minimize the loss of activity, designing flight schedules that will create congestion at green airports should be avoided.
- A tax system with indirect taxes should be preferred for flights for tourism purposes because in this way, financial anesthesia will arise, and tax revenue can be collected. This will facilitate the financing of green airports.
- In a tax system where there are popular taxes such as the carbon tax, efficiency cannot be achieved on first-class and long-haul flights. Instead, resorting to traditional taxes can eliminate tax refusal.
- Taxpayers who fulfil their obligations in the tax system to be selected should not be penalized. However, taxpayers who fulfil their obligations should be rewarded. This logic will increase the tax zeal of taxpayers who do not fulfil their obligations.
- The tax system to be chosen should not create crowding-out effect. Otherwise, the idea of a perfect competitive market may disappear.

A tax system, the characteristics of which are mentioned above, will ensure the financing of green airports and, consequently, their sustainability. Therefore, it will be possible to contribute to the sustainability of the green economy in the field of civil aviation through a fiscal instrument such as an optimal taxation.

## References

Abdul Baki, G., & Marrouch, W. (2022). Environmental taxation in the Bertrand differentiated duopoly: New insights. *Resource and Energy Economics, 70*, 101329. https://doi.org/10.1016/j.reseneeco.2022.101329

Ballini, F., & Bozzo, R. (2015). Air pollution from ships in ports: The socio-economic benefit of cold-ironing technology. *Research in Transportation Business & Management, 17*, 92–98. https://doi.org/10.1016/j.rtbm.2015.10.007

Boca Santa, S. L., Ribeiro, J. M. P., Mazon, G., Schneider, J., Barcelos, R. L., & de Guerra, J. B. S. O. A. (2020). A green airport model: Proposition based on social and environmental management systems. *Sustainable Cities and Society, 59*, 102160. https://doi.org/10.1016/j.scs.2020.102160

Driffill, E. J., & Rosen, H. S. (1983). Taxation and excess burden: A life cycle perspective. *International Economic Review, 24*(3), 671. https://doi.org/10.2307/2648793

Dube, K., & Nhamo, G. (2019). Climate change and the aviation sector: A focus on the Victoria Falls tourism route. *Environmental Development, 29*, 5–15. https://doi.org/10.1016/j.envdev.2018.12.006

Ekici, S. (2020). Thermodynamic mapping of A321-200 in terms of performance parameters, sustainability indicators and thermo-ecological performance at various flight phases. *Energy, 202*, 117692. https://doi.org/10.1016/j.energy.2020.117692

Gago, A., Labandeira, X., Picos, F., & Rodríguez, M. (2009). Specific and general taxation of tourism activities. Evidence from Spain. *Tourism Management, 30*(3), 381–392. https://doi.org/10.1016/j.tourman.2008.08.004

Hájek, M., Zimmermannová, J., & Helman, K. (2021). Environmental efficiency of economic instruments in transport in EU countries. *Transportation Research Part D: Transport and Environment, 100*, 103054. https://doi.org/10.1016/j.trd.2021.103054

Hilton, D., Charalambides, L., Demarque, C., Waroquier, L., & Raux, C. (2014). A tax can nudge: The impact of an environmentally motivated bonus/malus fiscal system on transport preferences. *Journal of Economic Psychology, 42*, 17–27. https://doi.org/10.1016/j.joep.2014.02.007

Joshi, Y., & Rahman, Z. (2015). Factors affecting green purchase behaviour and future research directions. *International Strategic Management Review, 3*(1–2), 128–143. https://doi.org/10.1016/j.ism.2015.04.001

Kayaalp, K., Metlek, S., Ekici, S., & Şöhret, Y. (2021). Developing a model for prediction of the combustion performance and emissions of a turboprop engine using the long short-term memory method. *Fuel, 302*, 121202. https://doi.org/10.1016/j.fuel.2021.121202

Korul, V. (2003). *Havaalanı Çevre Yönetim Sistemi, 3*(1), 99–120. Checked on 12/12/2022.

Nilashi, M., Zakaria, R., Ibrahim, O., Majid, M. Z. A., Mohamad Zin, R., Chugtai, M. W., et al. (2015). A knowledge-based expert system for assessing the performance level of green buildings. *Knowledge-Based Systems, 86*, 194–209. https://doi.org/10.1016/j.knosys.2015.06.009

Öndeş, E. B. (2022). *Pilotlarda Aşırı Yorgunluk Kavramı Üzerine Nicel Bir Çalışma: Türkiye*. Master's dissertation. Anadolu Üniversitesi, Eskişehir. Sosyal Bilimler Enstitüsü, checked on 12/15/2022.

Saremi, M., Fallahi, F., Pels, E., Salmani, B., & Covich, M. P. (2021). Ramsey pricing of aircraft landing fees: A case study of Iranian airports. *Research in Transportation Economics, 90*, 100922. https://doi.org/10.1016/j.retrec.2020.100922

Seetaram, N., Song, H., Ye, S., & Page, S. (2018). Estimating willingness to pay air passenger duty. *Annals of Tourism Research, 72*, 85–97. https://doi.org/10.1016/j.annals.2018.07.001

SHGM. (2010). *Havaalanlarında Çevresel Etkiler*. With assistance of Sivil Havacılık Genel Müdürlüğü, checked on 12/12/2022.

Shrivastava, P. (1995). Ecocentric management for a risk society. *The Academy of Management Review, 20*(1), 118. https://doi.org/10.2307/258889

Silva, E. S., & Henkes, J. A. (2021). Uma Analise Sobre As Exigências, Medidas E Procedimentos Para Obter A Qualificação. *Green Airport, 1*(2), 142–163. Available online at https://rbac.cia.emnuvens.com.br/revista/article/view/28, checked on 12/12/2022

Slemrod, J. (1990). Optimal taxation and optimal tax systems. *Journal of Economic Perspectives, 4*(1), 157–179. Available online at https://www.jstor.org/stable/1942838#metadata_info_tab_contents, checked on 12/15/2022

Timko, M. T., Onasch, T. B., Northway, M. J., Jayne, J. T., Canagaratna, M. R., Herndon, S. C., et al. (2010). Gas turbine engine emissions—Part II: Chemical properties of particulate matter. *Journal of Engineering for Gas Turbines and Power, 132*(6), Article 061505. https://doi.org/10.1115/1.4000132

Uysal, Y. (2022). İklim Değişikliği ve Küresel Isınma ile Mücadelede Yerel Yönetimlerin Rolü: Tespitler ve Öneriler. *kesit, 30*(30), 324–354. https://doi.org/10.29228/kesit.57382

Wey, C. C., Anderson, B. E., Wey, C., Miake-Lye, R. C., Whitefield, P., & Howard, R. (2007). Overview on the aircraft particle emissions experiment (APEX). *Journal of Propulsion and Power, 23*(5), 898–905. https://doi.org/10.2514/1.26406

Winter, S. R., Crouse, S. R., & Rice, S. (2021). The development of 'green' airports: Which factors influence willingness to pay for sustainability and intention to act? A structural and mediation model analysis. *Technology in Society, 65*, 101576. https://doi.org/10.1016/j.techsoc.2021.101576

Xiong, S.-H., Chen, Z.-S., Chiclana, F., Chin, K.-S., & Skibniewski, M. J. (2022). Proportional hesitant 2-tuple linguistic distance measurements and extended VIKOR method: Case study of evaluation and selection of green airport plans. *International Journal of Intelligent Systems, 37*(7), 4113–4162. https://doi.org/10.1002/int.22714

Yu, Z., Timko, M. T., Herndon, S. C., Miake-Lye, R. C., Beyersdorf, A. J., Ziemba, L. D., et al. (2019). Mode-specific, semi-volatile chemical composition of particulate matter emissions from a commercial gas turbine aircraft engine. *Atmospheric Environment, 218*, 116974. https://doi.org/10.1016/j.atmosenv.2019.116974