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# The Analysis of the Environmental Impacts of the Proposed Third Runway at London Heathrow Airport and Why It Will Make Aviation Management Easier

## Literature Review

### *Introduction*

The chapter delves into the scholarly contribution of various authors to the topic, aims, and objectives of the study. The information obtained is presented under different subheadings to bring a coherent understanding of various areas of interest. The findings of different authors are effectively sought out through the chapter to bring an in-depth understanding of various aspects relating to the proposed expansion project.

### *The Need for Expansion of Airports*

In a fast-globalizing world, air transport is an important instrument in enabling economic, social, and cultural growth and development. Air travel facilitates long- and short-distance travels to urban and rural areas globally (Solvoll and Hanssen, 2018). Currently, there is an increase in air traffic and a projected exponential increase in the future. Therefore, there is a need to raise the number of airports and expand existing ones to address the growing demand (Cordeil, Dwyer and Hurter, 2016). The UK is among the many countries that have proposed an expansion project to their airports while encouraging digitalization of the construction industry (Biancardo *et al.*, 2020). For instance, Heathrow Airport's expansion project involves the construction of a new third runway, terminal, and car park. The project is estimated to bring about an economic increase of £61 billion while offering employment opportunities to hundreds of thousands of locals (Cairns, 2016). However, despite the economic benefits of the expansion, Heathrow Airport, London has received many backlashes for its proposed construction of a third runway.

## *Congestion*

Airport congestion is a significant challenge affecting many airports across the globe. The problem can be attributed to the fact that many airports have experienced a considerable growth in aviation traffic (Bongo and Ocampo, 2018; Liu *et al.*, 2019; Oliveira, Lohmann and Costa, 2016; Yang *et al.*, 2016). Therefore, airport facilities are stretched as many planes and passengers are forced to use the insufficient resources available (Shone, Glazebrook and Zografos, 2020). The increase in the number of flights and airplanes in a particular airport makes the existing resources, such as runways and terminals, insufficient to handle the high demand. As a result, major airports globally are forced to undertake expansions to meet the demand. However, despite many countries considering the expansion of their runways, the process is not feasible for all airports. Therefore, the management of airports is significantly affected as the airports over-exploit their current resources, which leads to their rapid depreciation and reduced customer satisfaction.

Airport traffic delays have been recorded to cause significant losses globally. For instance, between 2005 and 2016, Europe witnessed 40% delays in arrival flights (Wang and Wang, 2019). Moreover, Wang and Wang (2019) argue that the daily delays were approximately 29 minutes. The delays are responsible for some of the losses that airports have been making over the years.

There are many approaches that can be used to solve the problem of airport congestions. For instance, the use of multi-criteria decision-making (MCDM) models can help reduce airport congestion (Bongo and Ocampo, 2017). Moreover, the expansion of current airports can offer a solution to the challenge of airport congestion. Expansion projects can involve the addition of extra runways to reduce flight delays. As a result, airport management and passenger satisfaction can improve drastically as more flights will be able to use the airport while passengers' waiting time will be reduced. Therefore, since airports play a significant role in ensuring that countries operate

optimally due to the increase of international trade and globalization, it is important to consider such a solution-based approach to the problem of airport congestion.

Similarly, airline networks have a significant impact on airport congestion. The network structure of airports determines the frequency of delays in airports (Fageda and Flores-Fillo, 2016). Therefore, by increasing airport network efficiency, airport management can be improved significantly. The expansion process of Heathrow Airport can lead to an enhanced network efficiency since the airport infrastructure will be upgraded. Proper coordination of the three runways at Heathrow will ensure that the airport saves on its cost by exploiting economies of scale due to the increase in airport traffic as a result of expansion (Fageda and Flores-Fillo, 2016). Moreover, the competitiveness of Heathrow Airport will boost if the construction of a third runway is undertaken. The improvement will be attributed to the increase in the number of flight destinations and the number of connecting flights through the airport.

#### *Major Challenges for the Heathrow Airport Expansion Project*

The construction of the third runway at Heathrow Airport faces significant challenges. One of the major challenges is the backlash over the project's environmental impact. Bell and Fisher (2020) argue that large-scale projects have varied benefits and impacts. Similarly, the authors claim that large-scale projects require a polycentric approach to decision making. As a result, Bell and Fisher (2020) hypothesize that the development of the projects will lead to controversies due to the uncertainties they hold about the future. Hence, when thinking about large-scale projects, it is important to conduct extensive research and consultation and ensure that most facets of the project are adequately regulated and monitored. The use of legal means is one of the most effective methods of undertaking mega projects.

For over a decade, the Heathrow third runway project has been faced with court drama and upheavals. Ghaleigh (2021) confirms that the proposed expansion of Heathrow Airport by way of a third runway has experienced a lengthy legal controversy. Moreover, the author claims that the acquisition of the land where the airport is located was performed through a litigation process. Previously, the location of Heathrow Airport was an orchard obtained through emergency wartime in 1946 (Ghaleigh, 2021). The court cases have taken a significant amount of time since the proposal of the expansion dates back to the 1960s when the suggestion for its site was first made by Harold Wilson (*Timeline of Heathrow's third runway - the longest take-off in history*, 2021). The court cases and appeals have significantly delayed the implementation of the expansion proposal for decades.

#### *Environmental Threats from Aviation Industry*

There is an increase in the development and growth of the aviation industry. According to aviation projections, the trend is set to grow in the future (Boonekamp, Zuidberg and Burghouwt, 2018). Road transport is the leading energy consumer with 358.6 Mtoe, while the aviation sector follows with 47.7 Mtoe for international aviation and 5.54 Mtoe for domestic aviation (Prussi and Lonza, 2018). Mtoe is an acronym that represents mega or million tonnes of oil equivalent. As a unit, Mtoe is used to express the quantity of energy that is produced when a single mega tonne of crude oil is burnt. Moreover, there has been an increase in the recorded number of passengers using aviation travel. For instance, in the year 2016, there was an estimated 973 million passengers in the aviation industry, which is a 5.9% increase compared to 2015 (Prussi and Lonza, 2018). As a result, aviation, contrary to rail and inland waterways, has recorded an increase in energy consumption up to 2.0 Mtoe between 1990 and 2015 (Prussi and Lonza, 2018). Therefore, the data

shows that there is a need for strategies to be employed in the aviation sector to reduce energy consumption, which has consequent negative environmental impacts.

There are many industries that significantly influence climate change. For instance, the upward trajectory growth of the aviation industry due to high demand and popularization has led to the subsequent impact on climate change (Jones, Hine and Marks, 2017). Ryley, Baumeister, and Coulter (2020) highlight that the aviation industry has been referenced as a contributor to climate change through the emission of greenhouse gases. However, the authors emphasize the fact that there has been limited research on the efforts for the industry to accommodate to the challenges of climate change (Ryley, Baumeister and Coulter, 2020). Therefore, with the increase in the number of planes and aviation greenhouse gas emissions, there is a need to monitor the industry. The heavy use of energy needed by airports makes it difficult to maintain a low level of greenhouse gas emissions.

#### *The Need to Address Global Climate Change*

International pressure to adopt the environmentally friendly approach for companies has led to the growth in demand for an immediate course of action. Banister (2019) claims that climate change has become a vital topic as the imperative to take urgent action increases. Additionally, the rise in greenhouse gas emissions has led to the escalation in the attention given to the topic of climate change and environmental impacts (Simpson *et al.*, 2021). Banister (2019) reports that there has been an increase in the level of carbon dioxide in the atmosphere from 354.4 parts per million volume (ppmv) to 408.5 ppmv between 1990 and 2018 (Banister, 2019). The upsurge is linked to the heavy dependence on fossil fuels over the mentioned period. Banister (2019) further argues that under the Climate Change Act adopted in 2008, the UK is committed to achieving a zero-net greenhouse emission by 2050 (Banister, 2019). The decision was reached due to the

increase in demand to save the planet for future generations. Banister's (2019) research shows that the goals of reducing the depletion of the ozone layer and climate change can be achieved by making changes in the transport sector. Optimal changes in the transport sector, especially the aviation sector, will provide opportunities to solve the problem of greenhouse emissions.

There has been a significant campaign for airport expansion projects to adapt to climate change. Burbidge (2018) argues that the momentum for the global aviation industry to increase resilience and adapt to climate change is consistently improving. Additionally, the author claims that there should be plans to adapt the aviation industry to continuous climate change. Further, Burbidge (2018) suggests that the first step in adapting the aviation industry to climate change is to determine the main priorities of the sector and finding the measures to improve climate change resilience. Burbidge (2018) argues that the need for climate change resilience is gaining increased traction as the public's awareness is rising as a result of campaigns from activists and non-governmental institutions. As a result, more and more people become interested in saving the environment. Consequently, there is a surge in demand for better methods and techniques to provide solutions to the problem of climate change as the aviation industry strives to mitigate the potential environmental concerns (Baumeister, 2020). Baumeister (2020) further claims that it is important for organizations to conduct risk assessments of the potential threat of climate change. The measurements will provide a wide knowledge base and help in finding gaps that can be exploited to reduce the environmental impacts of the aviation sector.

### *Green House Gas Emissions*

The aviation sector is experiencing an increase in demand for safety not only for flight passengers and employees but also for nature and climate change. Kılıç, Uyar and Karaman (2019) argue that corporate social responsibility (CSR) has taken center stage in the aviation industry due

to the increase in environmental awareness by the public. The public is cornered with the amount of greenhouse gas emissions (GHGEs), depletion of natural resources, and climate change as a result of various economic activities such as aviation. Additionally, Kılıç, Uyar and Karaman (2019) claim that the heavy use of fossil fuels as energy sources in airports jeopardizes airport sustainability. The boost in the demand for air transport has led to a subsequent rise in the use of fossil fuel to transport the continuously growing number of passengers. As a result, there has been an increase in greenhouse gas emissions, which have a significant impact on the environment. The aviation industry has recorded an increment of a 6% bump in the use of energy in the last decade (Kılıç, Uyar and Karaman, 2019). The increase in energy use is directly proportional the increase in greenhouse gas emissions.

Compared to other transport sectors, the aviation industry is the only sector that has not witnessed a reduction in greenhouse gas emissions over the decade. Andrés and Padilla (2018) argue that EU-28 has gained a reduction of GHGEs by 22.4% in most sectors, with the exception of the transport sector, between 1990 and 2014. On the contrary, the transport sector depicted an opposite result as the greenhouse gas emissions increased by 13.3% over the same period. The escalation of carbon dioxide emissions can be compared to an increase of 104,558.5 thousand tons of carbon dioxide over the same period (Andrés and Padilla, 2018). Similarly, the expansion in greenhouse gas emissions coincides with a 24.2% increase in the use of energy over the same period, which is an equivalent of 352,936.3 thousand tons of fossil oil (Andrés and Padilla, 2018). The data indicates that there is a need to adopt urgent changes in the transport industry, especially the aviation sector, to reduce its environmental impacts.

Interestingly, similarly to the entire transport sector, which has fallen short of the greenhouse gas emission expectations, the aviation industry has been affected by this problem.

Other industries have strived to reduce emission of gases such as CO<sub>2</sub> as a way of addressing the problem of climate change. The production of CO<sub>2</sub> from energy-related sources reduced between 2019 and 2020 because of COVID-19. Surprisingly, even with the reduction, the aviation sector was still responsible for 2% of the CO<sub>2</sub> produced through human induction (Hasan *et al.*, 2021). Therefore, as the entire transport industry strives to address the issue of greenhouse gas emissions, it is important for the aviation departments as well to formulate strategies of mitigating more emissions.

### *Noise Pollution*

Noise pollution has a significant impact on human health and well-being. Collins, Nadybal, and Grineski (2020) argue that noise from transport modes can lead to hearing challenges and increase health risk factors to the affected individuals. For example, high levels of noise pollution can cause respiratory, cardiovascular, and high hypertension affiliated diseases and ailments (Collins, Nadybal and Grineski, 2020). Furthermore, noise pollution can cause sleep interference, especially for people living near airports, which can lead to changes in sleep patterns (Basner *et al.*, 2017). Airport noise has been linked to poor academic performance of students living near the airports (Basner *et al.*, 2017). Also, depression and anxiety have been attributed to the increase of airport activity for the individuals who are within the vicinity of the airport (Baudin *et al.*, 2018). In addition, Collins, Nadybal and Grineski (2020) claim that in extreme cases, noise pollution from airports leads to a growth in premature mortality rates. The scholars also argue that noise pollution can bring about interference in the communal life of the people living near airports and busy road transport avenues. Therefore, the quality of life is affected due to noise pollution caused by the increase in the number of flights operating daily in a given airport.

Research shows that noise pollution affects various members of society differently. Casey *et al.* (2017) claim that noise pollution impacts each demographic in a unique manner. Therefore, the effects of noise pollution on individuals may vary from one group to another. For instance, among the elderly, hearing loss can be experienced as the outcome of airport noise pollution (Casey *et al.*, 2017). Noise above 30 decibels can have severe interruptive impacts on people near an airport. Moreover, Casey *et al.* (2017) argue that noise pollution affects the body's nervous system even when an individual is asleep. Therefore, the dangers of noise pollution in the transport and aviation industry is not insignificant as it can cause numerous health problems.

At the same time, scholars note that the aviation industry is controversial for noise pollution. Homola *et al.* (2019) argue that it is possible to reduce aviation noise pollution through the standard instrument departure (SID) routes optimization. The strategy will require that the aviation industry employ routes according to area navigation (RNAV) to minimize the noise pollution to the people living near the airport (Homola *et al.*, 2019). Therefore, the solution to noise pollution requires smart approaches around the airport. For instance, the use of Boeing 787 airplanes, which are built to reduce noise pollution through advanced technology, can be significant in providing smart solutions to air pollution around the airport (Petrescu *et al.*, 2017). Moreover, the assimilation of effectively calculated flight departure and navigation systems will help increase the efficiency of airport operations by reducing the time it takes planes to land or take off (Homola *et al.*, 2019). Understanding the possible impact of noise pollution is important because it is one of the environmental concerns associated with the expansion of the airport. Research shows that the expansion of Heathrow Airport will expose more than one million of people to almost constant noise (Weston, 2021). Therefore, concerns regarding noise pollution must be analyzed and addressed as the expansion project is adopted.

### *Sustainability in the Aviation Industry*

According to Kumar, Aswin, and Gupta (2020), airport sustainability can be defined as effective management that provides economic, operational, and natural resource integrity. Moreover, airport sustainability can be further viewed as the social responsibility of the airport in ensuring that the future of the airport is not jeopardized (Chang and Yeh, 2016). Therefore, through the use of airport sustainability methods and techniques, an airport can be considered viable or not viable for the long term (Dhakal *et al.*, 2020). As a result, due to the high emission of anthropogenic gases, airports are among the most appropriate sectors for adopting green technologies in order to reduce their environmental impact.

One of the methods of decreasing airports' environmental impact is through the use of so-called 'green technologies.' According to Baek, Kim and Chang (2016), airport sustainability can be achieved with the implementation of hybrid energy sources for electricity. The hybrid electricity sources will majorly come from the use of renewable energy sources, such as wind and solar energy (Kim, 2020). Scholars argue that airports are the most appropriate target facilities for the project of hybrid energy use because they require much energy to maintain and operate a large number of planes. Similarly, airports are the target for the alternative energy sources because they process a wide variety of activities.

### *Outcomes of the Literature Review*

The literature review is highly instrumental because it gives a scholarly insight into the research topic. For instance, by providing scholarly thoughts on the need for expansion, the literature review justifies the debate on the project's expansion. Similarly, the environmental threats discussed aid in showing that the argument in consideration is two-sided. Generally, the

section is important because it shows that various scholars have explored different aspects of the topic.

### *Conclusion*

In conclusion, the coherent and well-organized literature research above aids in enhancing a deeper understanding of the study's research question and main concepts. The information obtained makes it possible to continue with more focused research to answer the research questions accurately and meet the set aims and objectives. Therefore, it is important to move to the research methodology section to discuss the research methods that will help in coming up with the expected findings.

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