IMPLEMENTING SUSTIANABILITY IN THE INTERNATIONAL AIRPORT OF SHARM EL-SHAIKH

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ABSTRACT

The environmental effects associated with airport construction and operational activities (such as building operation and ground service equipment (GSE)) are important to take into account, particularly in light of the fact that the air transportation sector will face greater challenges in reducing their environmental impacts as other transport sectors turn "green." According to estimates, the aviation sector contributed 2.5% of the world's greenhouse gas (GHG) emissions in 2018. Sustainability at airports is a growing field of research. The aviation and airport communities are aware of the crucial part that airport infrastructure plays in fostering positive results for both human and environmental health. Hence, the purpose of this paper is to present the impact of applying sustainability goals in international Airport of Sharm El-Shaikh and reducing carbon emissions. As a methodology, this research paper followed the qualitative approach through field visits and conducting strucutred and unstructred interviews. The main finiding showed several upgrade and expansion works have been accomplished in the airport to cope with development plans that coincided with Sharm El Sheikh City's hosting of the United Nations Climate Change Conference (COP27) in 2022.

KEYWORDS: Carbon Emissions, Environmental Degradation, Sustainability, Sharm El-Shaikh airport

1. INTRODUCTION

Over the years, sustainability concept became important as it aims at improving the quality of people' lives, protecting the ecosystem and preserving natural resources for future (Zadeh et al. ,2018). One of the major implementation science issues is comprehending sustainability. The lack of uniform terminology in the literature is one of the major obstacles to understanding sustainability. Even when evaluating sustainability, the majority of implementation studies omit to provide a concept of sustainability (Moore et al., 2017). The examination of a reference system's social, economic, and environmental aspects is commonly referred to as sustainability (Salas-Zapata and Ortiz-Muñoz, 2019).

Energy management, emissions management, water and effluents management, and solid waste management are some of the different facets related to the environmental issue. It was acknowledged that community investment, staff development, and noise control are all part of the social component. While, the economic components of sustainability are influenced by factors including economic contribution, passenger experience, airport safety, and security.

In the avaiation sector, with the development of aircraft crews, contemporary airports, security and airports departments, and airports, the sector is facing a number of parallel challenges related to technological, economic, and commercial transformations and changes. Airports in particular will be aware of these challenges. This is done in order to combat the fierce competition and emphasise professionalism in order to attain the necessary profitability and quality, which will undoubtedly result in profitability, market survival, and continuity. Additionally, it helps to sustain the infrastructure of buildings used by airports, shipping and transportation firms, and businesses that produce aircraft equipment and spare parts, as well as to achieve the best possible use of time, money, and other resources.

Sreenath et al. (2021) found that environmentally sustainable practices have greater importance than social and economic initiatives in the airport context. Thereof, this paper aims to assess sustainable practises in airports in Egypt, with refernce to Sharm El-Sheikh airport as a case study.

The airports have a huge negative effect on the environment (Ali et al., 2022) .Some of the major issues raised with regard to airport operations, such as emissions from aircraft, noise from aircraft during takeoff and landing, climate change, land use, waste disposal, energy consumption, and effects on the social structures of local communities, demand the attention of the regulatory authorities (Sreenath et al., 2021). The effects on the environment of several pollutant emissions from aircraft exhaust gases during takeoff and landing, such as carbon monoxide (CO), carbon dioxide (CO2), nitrogen oxide (NOx), and hydrocarbon (HC) (Atasoy et al., 2021).

In 2016, Egypt's Vision 2030 was set as a national agenda launched that reflects the country's long-term strategic plan to achieve the principles and goals of sustainable development in all fields. Egypt's Vision 2030 reflects the three dimensions of sustainable development: the economic dimension, the social dimension, and the environmental dimension (Mouneer, 2021).

The motivation of this paper's research is to examine the idea of sustainable development in the Egyptian airports. Clarifying the function of sustainable development for legislators and decision-makers, who will have an impact on the standard of airport services and its overall performance, is the basis for the novelty.

2. LITERATURE REVIEW

Due to the growing importance of sustainability, numerous studies are beginning to emphasise its significance in airports (Hubbard and Hubbard, 2019). Hence, numerous airport operators have started putting sustainability efforts into practise as a result of new rules pushing airports to create sustainability programmes (Santa et al., 2020). In general, aviation plays an important role in modern social economies, providing connectivity and accessibility, and facilitating trade. Airports are critical connection points in the air transportation system and regional connectivity as well. Along with the growth of airport infrastructure, airport related business, commercial, residential and spatial development takes place in surrounding airports associated with surface transportation infrastructure (Kacar et al., 2022). It is highlighted that "sustainable airports" can be developed by incorporating the sustainability concept into the airport planning and then taking care of the airport sustainability issues and barriers.

Economic sustainability (long-term economic growth, stable employment, infrastructure development) and environmental sustainability (limiting of negative externalities—noise, pollution) of the operation of the airport are frequently in conflict with one another. As a result, airport expansion has an impact on local planning and frequently results in restrictive municipal zoning regulations that restrict possible development in the impacted region in an effort to reduce negative externalities (Batóg et al., 2019).

The use of energy is very high in airports. This is because of the sizable, equipped buildings (both in the passenger terminals and the non-passenger sections), the high demand for lighting and electric equipment, and the energy needs of the numerous facilities housed within the airport precinct. A significant amount of the energy used by airports is used by air conditioning systems. The use of air conditioning, cooling, and heating accounts for over 70% of the energy used in airport terminal buildings. This rate might be higher in places with a colder environment (Baxter et al., 2019).

Policymaking, commerce, social responsibility, the environment, and service quality are all aspects of airport sustainability (Chourasia et al., 2021). Also, the airports contribute to region's economic development, as they have a negative impact on the environment and on the communities around them. Aviation accounts for 2.5% of greenhouse gas emissions (Greer et al.,2020).

However, the operation of airports has repercussions for the environment, including noise, air and water pollution, and the use of natural resources, some of which have the potential to limit airport expansion. Also, stricter regulations on carbon consumption and greenhouse gas emissions are put in place due to growing public concern over climate change. Many airports

are unable to utilise their capacity to the maximum extent as a result, especially when the mitigating cost is extremely high (Kumar et al., 2020).

The study revealed that there is a dearth of environmental indicators that are specialised in a given area, particularly civil aviation. The environmental statistics data also made it clear that without the use of environmental indicators like the environmental footprint, it is difficult to measure environmental performance effectively and address issues brought on by economic expansion. In order to clearly demonstrate the environmental impacts brought on by economic development, it was necessary to call for the development of some specialised environmental indicators in the field of civil aviation that are simplified to make things easier and easier to use in measuring environmental performance. It is obvious that the decision-maker must take these indications into account as a fundamental development factor. Table 1 shows related environmnetal Egyptian laws.

Table 1: Related Environmnetal Egyptian Laws

Environmental Issues	Laws
Noise	Article 42 of Law 4, and article 44 of its executive regulations on maximum allowable limits for sound intensity.
Air Quality	Article 40 of Law 4 and article 42 of its executive regulations maximum allowable limits for the concentration of pollutants resulting from burning of fuels. Article 36 of Laws and article 37 of its executive regulations on maximum allowable limits for pollutants in exhaust gases Article 35 of Law 4 and article 34 of its executive regulations on maximum allowable limits for ambient air pollutants.
Waste Water	Law No. 93/1962 on standards for the discharge wastewater to the sewerage network and its Ministerial Decree 44/ 2000.
Hazardous Material	Article 32 of Law 4 on handling of hazardous materials.
Waste Management	Law No. 38/1967 amended by Law No. 31/1976, and Law 4 on public cleanliness and collection and disposal of solid Waste.

Therefore, given the limitations of the researchers' knowledge, it became necessary for Egypt to be one of the top nations in protecting the environment by creating environmental strategies for the civil aviation system and beginning to identify and implement environmental indicators that help reduce environmental degradation and, consequently, the economic decline in the civil aviation sector. In fact, a number of national and international organisations (including the World Bank, the United Nations Commission on Sustainable Development, the European Environment Agency, the Authority for Economic Cooperation and Development, and other institutions) have contributed to the development of numerous indicators. Despite this and the significance of the indicators created by these organisations, the majority of them fell short of offering a conclusive model suitable for each activity or business in accordance with a

particular setting. As a result, the civil aviation had to begin selecting and putting into practise environmental indicators to correspond with the growth and economic growth in the sector of civil aviation. In the egyptian airports, the development of sustainable concept is not fully applicable due to many fcators. Therefore, this paper aisms to examine the sustainable development Sharm El-Sheikh airport through applying the environmental sustainability management system.

3. PROBLEM, OBJETCIVES AND METHODOLOGY

This study examines sustainable practises at Egyptian airports using Sharm El-Sheikh airport as a case study. The following research objectives are addressed as follows:

- To study the impact of sustainable development on reducing air pollution.
- To assess the environmental sustainability management system in airport.

As a methodology, this research paper followed the qualitative approach through field visits and conducting strucutred and unstructred interviews. The interviews took place with chairs, directors, managers, emplyees and operators at the Sharm El-Sheikh International Airport, the headquarters of the Egyptian Company for Airports, which is affiliated to the Egyptian Holding Company for Airports and Air Navigation at the Ministry of Civil Aviation. This research used Sharm El-Sheikh International Airport as a case study to see the impact of applying sustainability practices in the airport. Interviewes conducted also with the head of the engineering sector of the Egyptian Company for Airports, the general manager of the technical office, the chairman of the company's board of directors, and the director of Sharm El-Sheikh International Airport. The interviews covered the following sectors:

- Crisis Management.
- Civil aviation security sector.
- Public relations sector.
- Quality management.
- Air graphics department.
- Aviation safety workers.
- Passenger service workers.
- Extension department.
- Environment and Occupational Health Department.
- Engineering Department of Sharm El-Sheikh International Airport.

These interviews made it clear that the new Sharm El-Sheikh International Airport structure is pollution-free and environmentally beneficial. The capacity of the airport to deal with environmental concerns of sustainability rises with each new terminal that is built there. Contributing to the 2022 Climate Conference is one of Sharm El-Sheikh Airport's most significant accomplishments (COP 27). Sharm El-Sheikh Airport is one of the main airports of the Egyptian Airports Company, which supports sustainable development and is environmentally friendly. and the Egyptian authorities and institutions began working on implementing sustainable practices inside Sharm El-Sheikh Airport. Due to these unique tourism aspects and proven safety measures, Sharm El Sheikh airport was selected as a case study in this paper.

4. *SHARM EL-SHEIKH INTERNATIONAL AIRPORT*

Egypt's South Sinai Governorate is home to the well-known Red Sea resort city of Sharm El-Sheikh. Due to its advantageous location at the confined entrance to the Gulf of Aqaba, the city has drawn considerable attention. Also, it has grown in importance as a travel destination due to the Red Sea's distinctive biodiversity of marine life. The airport in Sharm El-Sheikh is where the majority of tourists arrive. Accordingly, the Ministry of Aviation in Egypt began to adopt the concept of sustainable development for the United Nations Sustianable Development Goals (SDGs) policies relesead in 2015 (Perryman et al., 2022).

The Sharm El-Sheikh International Airport was developed to accommodate travellers and promote tourism, as evidenced by the following:

- The hall's capacity has been increased from 2.5 million passengers to 5 million people.
- The passenger terminal 2 has been developed.

In addition to increasing the number of customs exits in the international arrival hall from 1 exit to 2, it also included expanding the arrival hall by 1000 square metres and supporting it with 2 suitcases, expanding the international and local exit hall by 2000 square metres, expanding the travel area by 1000 square metres, and expanding the senior entrance by 1000 square metres.

In addition, the developing the passenger lounge has taken place as follows:

1. Rebuilding 40 administrative offices and a new clinic, increasing international arrival counters from 6 to 22 counters, and making counters for tourism offices and banks.
2. In addition to expanding the entrance to local travel.
3. Inspection gates and travel gates increased from 9 to 12 gates, to include 3 local gates, a transit hall gate, and 8 international travel gates.
4. Expansion of the passport counters area, passport counters from 6 to 14 passport counters.
5. Tarmac 2 and 3 were expanded at the airport, and a new one was established. A result, the airport can accommodate 67 planes instead of 46 planes.

6. Constructing an entry gate with only 4 lanes.
7. Establishing a civilized exit gate from the airport with 4 lanes.
8. Developing air production with a total area of 105,000 square meters.
9. A car parking area has been established and umbrellas have been set up with an area of 10,000 square meters.

4.1Discussion of Environmental Sustainability

The conducted interviews at Sharm El-Sheikh Airport show that there were different efforts applied to achieve the concept of environmnetal sustianbaility. This included:

First: Energy Governance

- Sources of electrical energy at the airport:

The main power source:

- Power line from the main network "Nabq Station" with a capacity of (15 megawatts).
- Power line from the main network "Al-Salam Station" with a capacity of (5 megawatts).

Backup power source: Emergency indoor stations with a total capacity of (300 kVA).

- Sources of solar energy at the airport:

ARSC has carried out a project to install a canopy above which is a solar power station with a capacity of 280 kilowatts (on high stands in the parking lot in front of Terminal 2).

- Lighting poles - solar heaters:

Solar energy is used in lighting poles of the airport wall.

There are 12 solar water heaters

Second: Airport Waste System

1. Solid waste:

- The solid waste resulting from the operation of the passenger and administrative buildings, the airside, the parking lots for buses and cars at the airport is disposed of by the cleaning company (System One), which transports it outside the airport to the public dumps in the governorate in Mandelaqa Al-Khanasir (the company does not recycle solid waste).
- Coordination is underway for the entry of Sharm El-Sheikh airport waste into the state system through a "specialized solid waste management company" (collection - transportation - sorting - recycling "safe disposal")
- Average monthly quantities of waste: approximately 160 tons

- It was directed to study finding alternative solutions to modify the path of exit of solid waste in Terminal 1 because it does not pass through the hall in front of passengers, provided that the timings for the exit of waste are determined in times other than operating times, in coordination with operations and the cleaning company.
- Sharm El-Sheikh International Airport is provided with CAN BANK waste machines.
- A study is required to sell solid waste to maximize the airport's economic return.

Third: Hazardous Waste

- Sources of hazardous waste at the airport: The Egyptian Company for Airports - EgyptAir Ground Services Company - The Egyptian Company for Aviation Services - Misr Petroleum Company). From figure 1 and the table, it appears that the waste has become increased.
- Types of hazardous waste: (oils - tires - batteries - radiation generators for X-RAY devices – waste medical generated from quarantine).
- Hazardous Waste Storage:

Fourth: Spent Oils - The quantities of spent oils are collected in drums placed in a vertical position in an environmentally safe manner

Fifth: Rubber - The temporary safe storage of the rubber is adhered to in an environmentally safe manner.

Sixth: Used Batteries - The spent batteries (dry or liquid) shall be properly placed and kept from breakage or internal acid leakage and shall be collected on wooden pallets.

Seventh: Radiation generators for X-RAY devices - they are delivered to the Atomic Energy Commission.

Eighth: Medical waste generated from the quarantine - It is collected in special bags inside the quarantine clinic at the airport and is transported through the Directorate of Health Affairs, Hazardous Waste Department, under the responsibility of the quarantine.

4.2 Waste Management at Egyptian Airports

From the conducted interviews, it was evident that the Egyptian Holding Company for Airports and Air Navigation (EHCAAN) has reviewed the most important achievements

made so far in its project to develop Sharm El Sheikh Airport as passenger throughput at the facility increases. This can be displayed through:

- The company explained that the airport upgrade plan is one of its most important sustainable development projects.
- Several upgrade and expansion works have been accomplished in the airport to cope with development plans that coincided with Sharm El Sheikh City's hosting of the United Nations Climate Change Conference (COP27) in 2022.
- The airport's infrastructure has been upgraded significantly and the passenger terminal expanded to accommodate five million travelers a year.
- In line with the global trend of green transition that is applied to airports, shifting to rely on new and renewable energies, Egypt has begun procedures for converting Sharm el-Sheikh Airport into a green airport, powered by solar energy units.
- This move comes in line with Egypt's Vision 2030 to achieve sustainable development, and the hosting of the South Sinai resort's hosting of the COP27 conference in November 2022. The following figure shows the amount of wastes per operator in 2021.

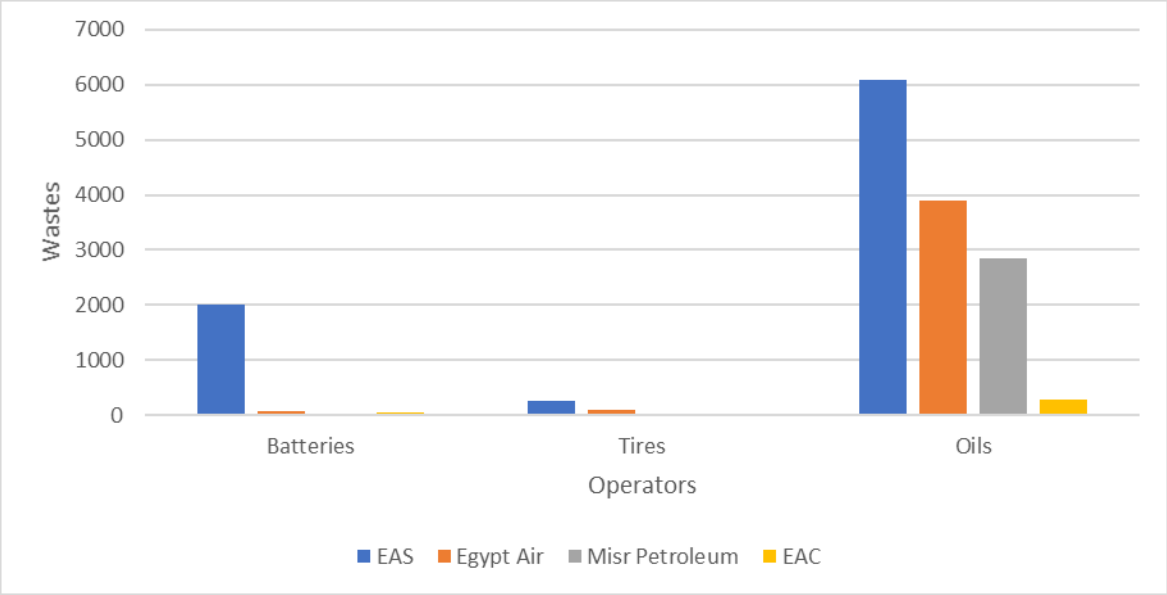

Figure1: Inventory of hazardous waste at Egyptian Airports 2021

Source: Ministry of Civil Aviation, 2022.

4.3 Findings of transforming Sharm El-Sheikh Airport into an environmentally-friendly airport

it is found that one of the projects being carried out in advance of Sharm el-Sheikh being designated a green city is the endeavour to transform the airport there into an environmentally friendly airport. Principal finings include:

- The Industrial Modernization Center's implementation of the Egypt Small Solar Cell Systems project resulted in success, and the Sharm El-Sheikh Green Airport project is a continuation of that achievement.
- The Sharm El-Sheikh Airport Project, carried out by the Industrial Modernization Center in collaboration with the United Nations Development Program, aims to promote the installation of solar cell systems in a variety of industries, including those related to manufacturing, commerce, tourism, education, and public buildings.
- Little solar power plants have been installed in Sharm El-Sheikh as a result of coordinated efforts by the ministries of energy, aviation, trade, industry, and the environment, as well as the Governorate of South Sinai and the United Nations Development Program.
- The goal of the project using modest solar energy systems is to promote the use of ecologically friendly energy and raise knowledge about how to best utilise the natural resources present in Sharm El Sheikh.

5. CONCLUSION AND FUTURE RESEARCH

Airports are working to increase sustainable development practices through reducing noise pollution, adopting indoor air quality control, and reducing the use of toxic substances. The conducted interviews revealed that the application of sustainability is very important, as it works to reduce pollution through the airport operators' endeavor to mitigate carbon emissions, reduce waste, enhance economic contribution, satisfy passengers, and meet the needs of employees.

It is concluded that Sharm el-Sheikh airport has adopted the policies and designs towards sustianability. It is recommended to adopt the concept of sustainability in airports by training to increase the practice of sustainability. For future researches, it is endorsed to benchmark between Sharm el-Sheikh airport and other airports in Egypt.

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