Journal of Sustainable Development of Transport and Logistics
journal home page: https://jsdtl.sciview.net

Öztürk, G., Tetik, A. E., & Demirci, E. (2022). Measuring sustainable added value: A study on airline companies. *Journal of Sustainable Development of Transport and Logistics, 7*(1), 23-35. doi:10.14254/jsdtl.2022.7-1.2.

ISSN 2520-2979

Measuring sustainable added value: A study on airline companies

Gökçen Öztürk *, Aybike Esra Tetik **, Ebru Demirci *

** Istanbul University,*
Avcilar Campus, Faculty of Transport and Logistics, 34322 Avcilar / İstanbul, Turkey,
PhD Student; Assoc. Prof., Department of Transportation and Logistics, Graduate School of Social Sciences
gokcen.cetin@ogr.iu.edu.tr; edemirci@istanbul.edu.tr
Telephone Number: +905544190588; +905052304975
*** Istanbul Esenyurt University,*
Zafer Mah. Adile Naşit Bulv. No:1 Esenyurt, İstanbul, Turkey
Research Assistant, Department of International Logistics, School of Applied Sciences
aybikeesratetik@esenyurt.edu.tr
Telephone Number: +905465065212

Article history:

Received: October 22, 2021
1st Revision: January 28, 2022
Accepted: March 30, 2022

DOI:
10.14254/jsdtl.2022.7-1.2

Abstract: It is critical to develop a picture of the airlines' economic and social characteristics to comprehend the growth potential of air transportation. In this context, sustainable reporting is a type of information report that emerges from the enterprises' economic, environmental, and social activities. Especially in recent years, airlines have preferred sustainable reporting to monitor the sustainability levels of their economic, environmental and social performances and to gain a competitive advantage. In this regard, sustainability reports disclose accurate, understandable, and sufficient information, particularly about environmental issues. Despite a boundless amount of literature on airline business models, there is a lack of studies related to the sustainable practices of airlines. One of the academic methods used to measure sustainability performance is the sustainable value-added approach, which provides for the opportunity cost. The project tries to explain the sustainable value-added method in measuring the sustainability performance and also to calculate the sustainable value-added of the first ten airlines in rankings estimated by the IATA report in 2020. This paper examines sustainable value-added results among the top ten airlines. A newly recent approach will be employed, using a content analysis of ten airlines' documentation including sustainability and annual reports.

Keywords: sustainable development, air transport, sustainability, sustainable added value, return to cost ratio.

Corresponding author: *Gökçen Öztürk*
E-mail: gokcen.cetin@ogr.iu.edu.tr

1. Introduction

Sustainability is becoming an increasingly popular topic for businesses. Intensifying carbon emissions and global warming require businesses to reconsider their practices to protect the environment and to make efforts to reduce carbon emission values and reduce water and energy use.

Air transport, in particular, plays and will continue to play a crucial role in industrialization and economic growth. Airlines continue to carry tourists and cargo over long and short distances. However, airline operations need to be reconsidered to ensure the industry's sustainability. This article will examine the sustainable added value of leading airlines and identify ways to achieve sustainability.

2. Literature review

An examination of the literature revealed no study that dealt explicitly with the sustainable added value of airlines. In this regard, this section includes key concepts related to sustainability in the theoretical framework. Based on the resource-based view, the paper discusses the current literature on what insight it offers for sustainable added value. Firstly, the concept of sustainability will be discussed, and then the main contributors to sustainability will be held in more detail.

2.1. Sustainability

The concept of sustainability was first included in the World Nature Charter document adopted by the International Union for Conservation of Nature (IUCN) in 1982. Accordingly, this is foreseen that the ecosystem, species, resources that people benefit from ought to be managed in a way that can achieve optimum sustainability, but this ought to be done in a way that does not endanger the integrity of ecosystems, species, and other resources (Aburto-Oropeza, et al. 2017). The constituents of sustainability are composed of economy, environment, and society. In another saying, the way of sustainability is able with solutions that consider the environment, society, and economy as a whole (Rad & Gülmez, 2017).

According to Goetz and Graham (2004), in the case of air transport, the primary environmental sustainability externalities are;

- Noise from aircraft engines, airframes, and ground traffic;
- Atmospheric pollution, nitric oxide/nitrogen dioxide, and carbon dioxide (CO2),
- Terrestrial pollution at airports, both airside and landside including water pollution from surface runoff, waste, and congestion,
- Rate of aviation fuel use.

Like all human activities involving combustion, most types of aviation release carbon dioxide (CO2) and other green gases into the earth's atmosphere, contributing to global warming and accelerating ocean acidification. In addition to the CO2 emitted by most aircraft in flight with the use of fuels such as Jet-A or Avgas, the aviation industry also contributes to greenhouse gas emissions from the generation of energy used in airport buildings, aircraft manufacturing and airport infrastructure construction (Hovarth and Chester, 2008).

In this study, the water withdrawals, energy consumption, CO2 emissions, and the leading airline companies' employments were examined to calculate their sustainable added value.

2.2. Sustainable development

Sustainable development is defined as "meeting the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). Daly (1991) defines sustainable development as one that satisfies three basic conditions: (a) its rates of use of renewable resources do not exceed their rates of regeneration; (b) its rates of use of non-renewable resources do not exceed the rate at which sustainable renewable substitutes are developed, and (c) its rates of pollution emission do not exceed the assimilative capacity of the environment (Mathur, 2014). Sustainable development strategies should aim to achieve social justice, economic growth, and environmental sustainability (Greene & Wegener, 1997).

Today, companies are looking for innovative alternatives for continuous improvement of performance and protection of the environment, so sustainable development is seen as a strategy to gain new markets, strengthen their brands and receive tax breaks. What once seemed just a burden has transformed into a competitive strategy (Teixeira et al., 2018).

Logistics must be built on the foundations of sustaining the global environment and sustainable development and replace the original one-way relationship between development and logistics, consumer life and logistics. While preventing the environmental damage caused by logistics, a logistics system should be established that can support the healthy development of the economy and consumption and ensure sustainable development. All of these require logistics enterprises to undertake social responsibility in production and operation activities to ensure that logistics activities are suitable for environmentally friendly cycle and development and coordinate the development of the natural and social environment with logistics activities (Seroka-Stolka, 2014).

2.3. Sustainable added value

Sustainable Added Value means the extra value which is created when the overall level of environmental and social impact is kept constant. Figge and Hahn (2004) propose a new approach to measure corporate contributions to sustainability, called Sustainable Added Value. It considers the efficiency and effectiveness of all three dimensions of sustainability. Sustainable Value Added relies on the solid sustainability paradigm as it indicates the amount of value created while maintaining a stable environmental and social performance. In other words, Sustainable Added Value is, in monetary terms, the extra value created by a company adjusted for the fundamental changes in economic and social activity (Figge & Hahn, 2004).

In 2005, Figge and Hahn developed and implemented a valuation methodology to calculate the cost of sustainability capital and ultimately the sustainable value creation of companies. They also demonstrated the applicability of the methodology by evaluating the sustainability performance of British Petroleum (BP). Kuosmanen and Kuosmanen (2009) critically examined Figge and Hahn's opportunity cost estimator in their paper "How not to measure sustainable value (and how one might)" and the results showed that the proposed estimator is based on a set of strong, unrealistic assumptions. Evidence from Monte Carlo simulations conducted by the authors shows that the proposed estimator performs very poorly even under ideal conditions. Subsequently, Figge and Hahn (2009) in the article “measuring sustainable value at all: A response to Kuosmanen and Kuosmanen” aimed to criticize Kuosmanen and Kuosmanen's 2009 Sustainable Value measurement. Adopting a production perspective and relying on a productive efficiency analysis, they argued that the proposed method for measuring Sustainable Value represents an invalid simplification based on restrictive and unrealistic assumptions.

Straková (2015), In the article “Sustainable Value Added As We Do Not Know It” suggested developing the original Sustainable Value Added, arguing that the best way to distinguish various value creations is to weigh environmental resources according to their impact on the environment. Based on an integrated analysis of the financial and environmental reports of selected German businesses, they concluded that businesses performed worse than the simple average when weighting environmental resources. Yüksel and Aracı, (2016) tried to explain the sustainable added value method in measuring the sustainability performance and to calculate the sustainable added value created by the businesses in the BIST Sustainability Index. The results show that 6 out of 7 companies operating in Turkey and included in this article contribute positively to sustainability. Demircioğlu Sarı, (2015) investigated how businesses provide the balance between economic, social, and environmental strategies, how they are directed to take precautions against the differences resulting from measurement and control, and how they provide the opportunity to compare among other businesses as a result of performance evaluation.

3. Research methodology

This study frames the sustainable value-added method to figure out corporate contributions to sustainability. As mentioned above, sustainable added value is a relatively new approach developed by Figge et al. (2006) that creates extra value for a company under the condition that every environmental and social resource is in total constant. From this point of view, in this part of the study, sustainable added value will be calculated as a methodology based on a sample application.

3.1. Sampling and data collection

The top ten airlines in rankings estimated by the IATA report in 2020 will be chosen as the research population to calculate the sustainable added value. The countries will be chosen as a benchmark. The top ten companies are Federal Express, Qatar Airways, United Parcel Service, Emirates, Cathay Pacific Airways, Korean Air, Lufthansa, Cargolux, Turkish Airlines, China Southern Airlines. Benchmark countries consist of the airlines' own countries, including America, Qatar, United Arab Emirates, Hong Kong, South Korea, Germany, Luxemburg, Turkey, and lastly, China. Here, airline traffic data presented for the ranking are sourced from airlines, the US Department of Transportation, or forecasted by IATA. For data collection, a content analysis of ten airlines' documentation, including sustainability and annual reports, is held.

3.2. Analysis of the data

This article fundamentally concentrates on value creation. The analysis is performed based on the knowledge that is freely available in the market today. The used methodology mentioned here is sourced from another study by Figge et al. (2006), which analyses the environmental performance of the manufacturing sector in 65 European countries. This European study is adapted into the airline sector and yields revealing results. The study of Figge et al. (2006) supports the practicability of the approach of the project. Based on the aim, it is possible to summarize the steps in more detail as follows just before showing how to calculate sustainable added value:

Step 1: Based on the sustainability report of airlines, firstly, the number of resources the company uses during a year is defined. The project heavily concentrates on environmental resources, including CO_2 emission, water usage, and energy consumption. For instance, in 2017, FedEx emitted approximately 17 million tons of CO_2. In this context, the data on resource use of airlines for 2017, 2018, and 2019 are collected with a content analysis of ten airlines' sustainability reports. Here, employment is assessed as resource use and sourced again from them regarding reports.

Step 2: EBIT is sourced from the financial statements of selected airlines. EBIT means Earnings before Interest and Taxes. Here, the main aim is to figure out how much return would be created by the company. For instance, the EBIT of Cathay Pacific Airlines in 2019 was about $441 million. In this context, the data on EBIT of airlines for 2017, 2018, and 2019 are collected with a content analysis of ten airlines' annual financial reports.

Step3: The third step determines the resource usage efficiency per unit. The calculation is done as follows:

$$Resource\ Usage\ Efficiency\ per\ Unit = \frac{EBIT}{Amount\ of\ Resource\ Usage}$$

Step 4: In this step, it is essential to determine how much return the benchmark creates instead of airlines. In the case of the project, the benchmark consists of the airlines' own countries. Here, the primary purpose is to compare the resource usage efficiency of each company with the average efficiency of resource usage in countries. To compare the return the countries create, GDP is used as a return. It is vital to figure out how eco-efficiently the selected countries use the environmental resources and employment to calculate the return the countries, which is the benchmark, would create. To illustrate, in 2018, Korea generated about 2400 $ per ton of CO_2 emissions. The calculation is done as follows:

$$Resource\ Usage\ Efficiency\ per\ Unit = \frac{GDP\ of\ Countries}{Amount\ of\ Resource\ Usage}$$

Step 5: It is simple to figure out how much return would be created by the benchmark with the resources used by airlines with the corresponding eco-efficiency of the benchmark, based on all of the above information. In brief, the opportunity cost of the resource used by airlines will be obtained. The calculation is done as follows:

$$Opportunity\ Cost = RUE\ per\ Unit\ of\ Airlines\ \boldsymbol{x}\ RUE\ \ per\ Unit\ of\ Benchmark$$

Step 6: The result of this step is called value contribution. In this step, the opportunity costs of each resource in each year are subtracted from the EBIT of the airlines. This step fundamentally demonstrates how much more or less value airlines would create with a resource compared to the countries which are called a benchmark. For instance, in China Southern Airlines, in all the years, the value contribution of the CO_2 emissions is negative. China Southern Airlines created approximately 39 million dollars less return compared to CO_2 emissions of China. It means that China Southern Airlines has not embraced the opportunity costs of the CO_2 emissions it has caused for three years.

Step 7: Up to this step, it has been presumed that each resource creates the absolute value by itself. Now, it is necessary all of those valuable contributions. The total value contribution is divided by the number of resources considered to calculate the sustainable value. In this context, all the resources are assessed for each year using the same methodology introduced now. In this step, the sustainable value provides information on how much more or less return has been created compared to the benchmark. Typically, other sectors could create sustainable value by using their resources more efficiently compared to a benchmark. However, for airlines, the issue is a bit different.

Step 8: This step defines the Return to Cost Ratio. The EBIT of the airlines is compared to the opportunity cost to calculate the Return to Cost Ratio. In this step, the main aim is to determine by which factor the EBIT of airlines surpasses the opportunity cost and vice versa. The Return to Cost Ratio is a crucial indicator that shows the factor by which airlines use their resources in a more or less efficient manner compared to the countries. Eventually, if Return to Cost Ratio is greater than unity, the airline uses the resources much more efficiently rather than its country. It means that airline creates Sustainable Value.

4. Results

Theoretical saturation and the method mentioned above have helped design qualitative research. In this part, practical research is conducted by illustrating a sample of 10 airlines. This part will be highly informative and meaningful with the statistical data that allows the project to address all points.

In quantitative research, how the sample is chosen has been stated last part. In this context, the current paper draws attention to how much more or less value the sample creates.

On data collection, it turned out that the airlines' approaches to reporting on carbon emission, water usage, and energy consumption showed a difference substantially. It means that all airlines do not publish certain data on resource usage in their operations. In this assessment based on the sustainability reports on the websites of the airlines, the following cases have appeared:

- FedEx has been preparing and publishing a sustainability report following the Global Reporting Initiative (GRI) Principles since 2008. FedEx provides data on energy consumption and carbon emission besides employment, but there is no information on the amount of water used.
- Qatar Airways has been preparing and publishing a sustainability report following the Global Reporting Initiative (GRI) Principles since 2016. The last report was dated May 2019. So, the data presented in the last report is lacking information on carbon emission for 2019. Moreover, there is no information available on the amount of energy consumption. Qatar is located in a region, where rainfall is infrequent and unpredictable, and where water resources are considered scarce. Therefore, due to the lack of information provided by the

country, the opportunity cost could not be calculated precisely. Just carbon emission and employment are included in the total resource usage.

- UPS has been preparing and publishing a sustainability report following the Global Reporting Imitative (GRI) Principles since 2002. UPS provides data on energy consumption, carbon emission, and employment rate, but there is no information on the amount of water used.
- Emirates has been preparing and publishing a sustainability report following the Global Reporting Initiative (GRI) Principles since 2010. The last report was dated 2017-2018. Emirates publishes a sustainability report as Emirates Group Environmental Performance Report. So, this report covers Emirates NBD Bank, Tanfeeth, and Emirates Islamic data. In this context, only carbon emission and energy consumption could be sourced from other resources like press briefing.
- Cathay Pacific Airlines has been preparing and publishing environmental activities since 1996 and corporate social responsibility (CSR) activities each year since 2006. However, it published the first comprehensive Sustainable Development Report in 2009 following the Global Reporting Initiative (GRI) Principles. The environmental and social indicators table in the sustainability report of Cathay Pacific Airlines explicitly provides all the resource usage values.
- Korean Air has been preparing and publishing a sustainability report following the Global Reporting Initiative (GRI) Principles. Since 2021, Sustainability Report has been renamed as ESG Report. Korean Air in 2020 report provides data on energy consumption, carbon emission, water usage, and the employment rate for the past three years. However, the opportunity cost could not be calculated precisely due to the lack of information on water usage provided by the country.
- Lufthansa has been preparing and publishing a sustainability report following the Global Reporting Initiative (GRI) Principles. Nevertheless, Lufthansa publishes the sustainability reports as a group. The Lufthansa Group is an aviation group. Its operation is worldwide, which consists of the segments Network Airlines, Eurowings, and Aviation Services. Aviation Services includes the segments Logistics, MRO, Catering and Additional Businesses and Group Functions. Therefore, sustainable value and the return-to-cost ratio will be assessed within the frame of Lufthansa Group. Moreover, the sustainability reports provide data on just carbon emission and employment rate. There is no information on the amount of water and energy used.
- Cargolux has been preparing and publishing a sustainability report following the Global Reporting Initiative (GRI) Principles. There is no available data on total energy used and water consumption. The data regarding energy consumption are departmentalized into different fields. Therefore, just carbon emission and employment are included in the total resource usage.
- Turkish Airlines has been preparing and publishing a sustainability report following the Global Reporting Initiative (GRI) Principles since 2013. Turkish Airlines provides data on carbon emission and employment, but there is insufficient information available on the amount of total water and energy used. Since energy consumption in the report is assessed as separately electrical energy consumption and natural gas consumption, the total energy used could not be placed in the table. Moreover, water consumption is presented as used just in the Headquarters, and Yenibosna and Technology, where the data on water consumption covered only part of the operations.
- China Southern Airlines has been preparing and publishing a sustainability report following the Global Reporting Initiative (GRI) Principles. China Southern Airlines provides data on carbon emission, total water usage, and employment, but there is inadequate information on the amount of total energy used. Energy consumption in the report is assessed as separately electrical energy consumption and natural gas consumption with different units. So, the total energy used could not be placed in the table.

As it can be summed up from the information above, it is crucial to point out that this study cannot fully reveal the sustainable added value of the airlines due to the lack of or inadequate information

included in the reports. When there is no data available, gaps can not be filled with estimates. Otherwise, the use of resources does not contribute to value creation. Here, the main aim is to find how much more or less value an airline creates with a resource compared to its country, or in other words, how an airline uses its resources in a more or less efficient way compared to its country.

The data used in the calculation methodology are sourced from financial statements and sustainability reports of the airline companies' websites. Airline companies publish financial and sustainable reports, which build and maintain trust in businesses annually. In the sample, the last three years (2017, 2018, and 2019) are used. The 2020 reports do not prefer due to the potential of misleading effect, as the COVID-19 pandemic devastated airlines in 2020. 2020 is the year that airline companies face severe challenges. Moreover, the statistical data of TUIK, World Bank, Ministry of Energy and Natural Resources, and IATA reports are the key references for calculation methods. Economic indicators on the company level, Earning Before Interest and Taxes (EBIT) are used, but on the benchmark level, 2017, 2018, and 2019 Gross Domestic Product (GDP) are sourced as a basis.

Here, it must be noted that the project does not 'wholly' reveal the sustainable added value of the airlines included in the sample due to the lack of or inadequate information on resource usage or unpublished data in the beneficiary sources.

The Project analyses the usage of environmental and social resources of 10 airline companies. The table below indicates the overall results of the project. It shows each airline from 2017 to 2019.

Table 1: Sustainable value

	Sustainable Value		
	2017	**2018**	**2019**
FedEx	-$49.260.916.690,13	-$49.260.916.690,13	-$60.376.663.304,72
QatarAirways	-$28.146.360.920,22	-$16.100.864.810,40	-$2.269.347.766,00
UPS	-$53.618.643.642,19	-$60.108.716.153,71	-$65.600.504.168,57
Emirates	-$1.470.475.218,66	-$4.506.556.192,11	-$3.361.335.036,58
Cathay Pacific Airlines	-$53.917.701.103,47	-$58.160.828.264,26	-$131.315.202.610,51
KoreanAirlines	-$17.299.773.648,04	-$18.036.058.936,67	-$18.469.625.335,50
Lufthansa	-$89.453.903.758,38	-$110.774.564.371,56	-$125.090.355.294,60
Cargolux	-$13.336.835.499,95	-$14.132.568.261,40	-$14.771.192.856,60
Turkish airlines	-$12.492.857.392,50	-$12.188.423.645,00	-$16.127.028.114,00
ChinaSouthernAirlines	-$7.513.816.482,67	-$9.649.622.395,00	-$12.702.246.032,67

Source: Own research

Table 2: Return to Cost Ratio

	Return to Cost Ratio		
	2017	**2018**	**2019**
Fedex	0,08	0,07	0,07
QatarAirways	0,10	0,14	0,42
UPS	0,12	0,10	0,11
Emirates	0,94	0,84	0,88
Cathay Pacific Airlines	0,01	0,00	0,00
KoreanAirlines	0,04	0,03	0,01
Lufthansa	0,04	0,03	0,02
Cargolux	0,01	0,02	0,01
TurkishAirlines	0,09	0,10	0,06
ChinaSouthernAirlines	0,18	0,10	0,10

Source: Own research

As could be seen, all companies have negative Sustainable Values. It firmly proves that airlines use environmental resources less efficiently than their countries. After all, the performance of airlines is below the countries, and these airlines do not create Sustainable Value with their environmental resources. As a prime example, FedEx held a sustainable value of -$60.376.663.304,72for the last year. The sustainable value approach determines how efficiently the airlines use their resources. Since sustainable value does not equal a positive value, it states that FedEx does not have a positive contribution to sustainability. The Return to Cost Ratio indicates how many times an airline earns its

opportunity cost. The Return to Cost ratio was calculated as 0,07 for 2019. This rate means that FedEx uses its resources 7% more inefficiently than the US economy.

Qatar Airways also has negative Sustainable Value creation between the years 2017 and 2019. It means that Qatar Airways used their bundle of environmental resources inefficiently based on the negative Sustainable Value. The sustainable value created by Qatar Airways has been calculated as -$2.269.347.766,00 in 2019 with a drastic fall from 2018. Negative Sustainable Value proves that Qatar Airways has a negative contribution to sustainability. Moreover, Qatar Airways' Return to Cost ratio was calculated as 0,42 and Qatar uses its resources inefficiently by %42.

Especially, Lufthansa, Cathay Pacific, and UPS could be considered the worst-performing company of this rank. It could be assumed the poor performance is partly because companies' activities do not cover environmental processes enough or maybe the lack of enough information published in reports.

The Sustainable Value of UPS has been calculated as -$65.600.504.168,57 between 2017 and 2019. It means that UPS does not contribute to sustainability positively. UPS is one of the worst-performing companies with the Sustainable Value result. Moreover, the Return to Cost ratio of UPS is approximately 0.11 for three years. This rate means that UPS uses its resources inefficiently by 11% compared to the US economy.

The Sustainable Value of Emirates has been calculated as -$3.361.335.036,58 in 2019. It is mounting evidence that Emirates does not contribute to the sustainable use of resources. In such a case, the negative result shows that Emirates does not create Sustainable value. Moreover, the 0,88 Return to Cost Ratio indicates that airlines use their resources less efficiently by 88% compared to the UAE economy.

Cathay Pacific Airlines' sustainable value has been calculated as -$131.315.202.610,51 with a dramatic fall in 2019. Sustainable Value analysis compares the efficiency of airline resource usage with the efficiency of the country. With the biggest negative result, it seems that Cathay Pacific Airlines was the worst-performing company in 2019. In other words, Cathay Pacific does not contribute to sustainability positively. As for Return to Cost Ratio, there is an interesting fact that the ratio is 0,00. It means that airlines give a near consistent result with the benchmark. Here, it must be noted that all the resource usage values have been given entirely in Cathay Pacific Airlines' report. It may be the main reason why the company gives the worst-performing result.

As one of the most promising attempts to measure the sustainability performance of firms, the sustainable value of Korean Air has been calculated -$18.469.625.335,50 in 2019. Based on comparing airline resource efficiency with the resource efficiency of countries, Korean Air does not contribute to more sustainable development. It means that it does not use its resources more productively than South Korea. A negative value contribution proves that the resource is not used in a value-creating way by the airline. In addition, the Return to Cost ratio of Korean Air has been calculated as approximately 0,01 for the last year. This rate means that Korean Air uses its resources 1% less efficiently than South Korea's economy.

In the case of Lufthansa, it could be seen that its sustainable added value is -$125,090,355,294.60 in 2019. It shows that Lufthansa is the second airline with the lowest sustainable added value. It means that the negative impact of the airline on sustainability is enormous. At the same time, the cost ratio appears to be 0.02 in 2019. It indicates that Lufthansa uses its resources 2% less efficiently compared to the German state.

The Sustainable Value of Cargolux has been calculated as -$14.771.192.856,60 in 2019. By looking at the years 2018 and 2017, negative sustainable added value remained almost the same. It can be interpreted as the Cargolux company has not made any improvements in its sustainability impacts in these three years. The firm had a cost ratio of 0.01 in 2019, indicating that it is using its resources 1% more inefficiently than the state of Luxembourg.

Turkish Airlines' sustainable value has been calculated as -$16.127.028.114,00 in 2019. Turkish Airlines, like seven other leading airlines, makes a negative contribution to sustainability. Considering the cost rate of 0.06, Turkish Airlines' efficient use of its resources is 1% lower than the state of Turkey.

The Sustainable Value of China Southern Airlines has been calculated as -$12.702.246.032,67 in 2019. This means that China Southern Airlines also does not contribute to sustainability positively. China Southern Airlines' cost ratio of 0.10 indicates 10% more inefficient resource use than the Chinese economy.

5. Discussion and conclusion

From this point of view, the study represents the first application of the Sustainable Value methodology to the aviation sector. Project determines the use of three environmental resources (CO_2 emissions, Water Usage, Energy Consumption) and one social resource (Employment) of 10 airline companies worldwide from 9 countries. The assessments are mainly based on the reports that airlines publish annually and World Bank statics. As one of the major successes, the project could be accepted as one of the most in-depth quantitative analyses of the environmental performance of the most successful airline companies in the world. With this respect, the project has provided inspiring and insightful results.

Here, the emphasis of the concerned study is instead on the interpretation of the results than on ranking. Firstly, the analysis identifies which environmental or social resources considerably contribute to value creation. Also, the analysis is the proof for which resources are not used in a value-creating way. In this context, Sustainable Value Approach could be used to carry out an analysis of the sustainable performance of the airlines. Moreover, Return to Cost Ratio ensures a comprehensive overview of the efficiency of environmental and social resource usage over time. Overall results prove that airline companies could monitor environmental performance based on environmental and social resource usage. Also, the used methodology provides airlines identify strengths and weaknesses of sustainable performance. In this way, airlines determine environmental policies and performance targets thoroughly.

The environmental externalities in the aviation sector are growing. Black (1996) defines sustainable transportation as "meeting the current transportation and mobility needs without compromising the ability of future generations to meet these needs" by combining environmental goals with economic and social goals. As widely known, airlines make specific policies and strategies that might reduce the environmental externalities of air transport. This effort makes sustainable strategies a critical factor in economic and social development at various scales. Based on this effort, today, airline companies are using sustainability reporting strategically. The value of the sustainability reporting provides airlines consider their impacts on sustainability issues. Besides, the reporting mechanism enables them to be more transparent about the risks and opportunities. A study on “sustainable aviation” states that aviation provides social and economic benefits, but conversely, its environmental sustainability is questionable (Upham, Thomas, & Gillingwater, 2003). Although technology has successfully reduced atmospheric emissions per individual aircraft and passenger, technological returns are declining and offset by the growth of aviation.

To sum up, the primary insight of this study is that it fundamentally demonstrates the value and significance of corporate environmental reporting. An accurate report produces informative and rich environmental performance assessments. The study shows that as long as the content of the reports with objective standards, researchers would gain an advantage of conducting an evaluation and other methods. In the project, selected airline companies have embraced the most widely adopted sustainability reporting way called the Global Reporting Initiative (GRI). In this regard, the study benchmarked and assessed sustainability performance based on informative sustainable reports.

Moreover, with highly informative and meaningful statistical data in sustainable reports, the study aims to offer insights about what airlines ‘could do’, instead of what sustainability reports ‘do’. The sustainable value-added methodology is adopted to measure the airlines’ corporate contributions to sustainability based on this aim. Sustainable added value is a relatively new approach that creates extra value for a company under a constant overall level of resource consumption. It is the only tool to show how much an airline company contributes to making the use of capital more sustainable. According to the results, it can be seen that out of 10 top worldwide airlines, none of them is contributing sustainability positively. The situation does not look very encouraging considering the impact of the airlines on the environment. Apart from the positive effects of airlines on sustainability, it is a situation that should be stopped that has tremendous adverse effects.

The sustainable added value found by considering CO_2 emission, energy consumption, water withdrawal, and employment factors shows us that the world's leading airline companies should make much more effort for a sustainable world. The fact that none of the firms have positive sustainable added value has shown us that more attention should be paid to this issue and new practices should be applied. Thus, we support more comprehensive analyses, and complementary applications of similar

sustainability measures all because the green future promise for airlines increases passengers' perception regarding the green image.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflicts of interest/Competing interests

Not applicable

Acknowledgements

All the authors participated in the article fairly enough to be considered authors of the article. We besides confirm that all third-party material has been acknowledged. The research was conducted in line with ethical provisions provided by researcher institutions. There is no conflict of interest in conducting and writing the article.

Citation information

Öztürk, G., Tetik, A. E., & Demirci, E. (2022). Measuring sustainable added value: A study on airline companies. *Journal of Sustainable Development of Transport and Logistics, 7*(1), 23-35. doi:10.14254/jsdtl.2022.7-1.2.

References

Aburto-Oropeza, O., López-Sagástegui, C., Moreno-Báez, M., Mascareñas-Osorio, I., Jiménez-Esquivel, V., Johnson, A. F., & Erisman, B. (2018). Endangered species, ecosystem integrity, and human livelihoods. *Conservation Letters*, *11*(1), e12358.

Black, W. R. (1996). Sustainable transportation: a US perspective. *Journal of Transport Geography*, *4*(3), 151-159.

Cargolux Annual Report. (2018). ww.cargolux.com Retrieved from https://www.cargolux.com/media-room/media-releases/media-releases/Archives-2019/Cargolux-reaches-new-high-in-2018

Cargolux Annual Report. (2019). www.cargolux.com: retrieved from, https://www.cargolux.com/media-room/media-releases/media-releases/Archives-2020/Cargolux-financial-results-for-2019

Cargolux Corporate Social Responsibility Report. (2018,2019). www.cargolux.com retrieved from, https://www.cargolux.com/about-us/Corporate-Responsibility/CSR-Report

Cathay Pacific Airways Limited Annual Report. (2019). www.cathaypacific.com retrieved from, https://www.cathaypacific.com/content/dam/cx/about-us/investor-relations/interim-annual-reports/en/annual_report_2019_eng.pdf

Cathay Pacific Airways Limited Sustainable Development Report. (2020). https://sustainability.cathaypacific.com: retrieved from, https://sustainability.cathaypacific.com/wp-content/uploads/2021/05/Cathay-Pacific_SD-Report-2020_EN.pdf

Cathay Pacific Airways Limited. (2018). www.cathaypacific.com : retrieved from, https://www.cathaypacific.com/content/dam/cx/about-us/investor-relations/interim-annual-reports/en/2018_annual_report_en.pdf

China Southern Airlines Annual Report. (2017). www.csair.com : retrieved from, https://sustainability.cathaypacific.com/wp-content/uploads/2021/05/Cathay-Pacific_SD-Report-2020_EN.pdf

China Southern Airlines Annual Report. (2018). www.csair.com: retrieved from, https://www.csair.com/en/about/investor/yejibaogao/2019/resource/c0bdc4d0789ce1cdcefe8cffef45749d.pdf

China Southern Airlines Annual Report. (2020). www.csair.com retrieved from, https://www.csair.com/en/about/investor/yejibaogao/2020/resource/ee107f1f23d71ed251c7ff0bedfedb71.pdf

China Southern Airlines Corporate Social Responsibility Report. (2018). www.csair.com retrieved from, https://www.csair.com/en/about/shehuizerenbaogao/resource/60fbc9aa8cb175093ee1bb28210be440.pdf

Greene, D. L., & Wegener, M. (1997). Sustainable transport. *Journal of Transport Geography*, *5*(3), 177-190.

Sarı, A. D. (2015). Sürdürülebilir Katma Değer Yaklaşımı İle Sürdürülebilirlik Ölçümü| Measure of Sustainability with Sustainable Value Added Model. *Uluslararası Akademik Yönetim Bilimleri Dergisi*, *1*(1).

FedEx Annual Report. (2017). retrieved from, https://s21.q4cdn.com/665674268/files/doc_financials/annual/2017/FedEx_2017_Annual_Report.pdf

FedEx Annual Report. (2018). retrieved from, https://s21.q4cdn.com/665674268/files/doc_financials/annual/2018/FedEx-Annual-Report-2018.pdf

FedEx Annual Report. (2019). retrieved from, https://s1.q4cdn.com/714383399/files/doc_financials/annual/2019/FedEx-Corporation-2019-Annual-Report.pdf

FedEx Global Citizenship Report. (2017). retrieved from, https://sustainability.fedex.com/FedEx_2017_Global_Citizenship_Report.pdf

FedEx Global Citizenship Report. (2018). retrieved from, https://sustainability.fedex.com/FedEx_2018_Global_Citizenship_Report_Data_Appendix.pdf

Fedex Global Citizenship Report. (2019). retrieved from, https://www.fedex.com/content/dam/fedex/us-united-states/sustainability/gcrs/FedEx_GCR_FINAL_4.17.19_144dpi.pdf

Figge, F., & Hahn, T. (2004). Sustainable value added—measuring corporate contributions to sustainability beyond eco-efficiency. *Ecological economics*, *48*(2), 173-187.

Figge, F., Hahn, T., Daverio, C., & Persson, M. (2006). *Sustainable value of European industry – a value-based analysis of the environmental performance of European manufacturing companies*. AdvanceProject.

Figge, F., & Hahn, T. (2005). The cost of sustainability capital and the creation of sustainable value by companies. *Journal of Industrial Ecology*, *9*(4), 47-58.. https://doi.org/10.1162/108819805775247936.

Figge, F., & Hahn, T. (2009). Not measuring sustainable value at all: A response to Kuosmanen and Kuosmanen. *Ecological Economics*, *69*(2), 244-249.

Goetz, A. R., & Graham, B. (2004). Air transport globalization, liberalization and sustainability: Post-2001 policy dynamics in the United States and Europe. *Journal of Transport Geography*, *12*(4), 265-276. https://doi.org/10.1016/j.jtrangeo.2004.08.007.

Horvath, A., & Chester, M. (2008). *Environmental life-cycle assessment of passenger transportation an energy, greenhouse gas, and criteria pollutant inventory of rail and air transportation*. University of California Transportation Center.

Korean Air Annual Report. (2018). www.koreanair.com retrieved from, https://www.koreanair.com/content/dam/koreanair/en/footer/about-us/inverstor-relations/financial-information/details/2018_consolidated.pdf

Korean Air Annual Report. (2019). www.koreanair.com retrieved from, https://www.koreanair.com/content/dam/koreanair/en/footer/about-us/inverstor-relations/financial-information/details/2019_consolidated.pdf

Korean Air Sustainability Report. (2019). www.koreanair.com retrieved from, https://www.koreanair.com/content/dam/koreanair/ko/footer/about-us/sustainable-management/report/2019_Korean%20Air%20Sustainability%20Report_en.pdf

Kuosmanen, T., & Kuosmanen, N. (2009). How not to measure sustainable value (and how one might). *Ecological Economics*, *69*(2), 235-243.

Lufthansa Annual Report. (2018). retrieved from, https://investor-relations.lufthansagroup.com/fileadmin/downloads/en/financial-reports/annual-reports/LH-AR-2018-e.pdf

Lufthansa Annual Report. (2019). retrieved from, https://investor-relations.lufthansagroup.com/fileadmin/downloads/en/financial-reports/annual-reports/LH-AR-2019-e.pdf

Lufthansa Annual Report. (2020). retrieved from, https://investor-relations.lufthansagroup.com/fileadmin/downloads/en/financial-reports/annual-reports/LH-AR-2020-e.pdf

Lufthansa Sustainability Report. (2018). retrieved from, https://www.lufthansagroup.com/media/downloads/en/responsibility/LH-sustainability-report-2018.pdf

Lufthansa Sustainability Report. (2019). retrieved from, https://www.lufthansagroup.com/media/downloads/en/responsibility/LH-sustainability-report-2019.pdf

Mathur, B. P. (2014). *Ethics for governance: Reinventing public services*. Routledge India.

Qatar Airways Annual Report Fiscal. (2017). retrieved from https://www.qatarairways.com/content/dam/documents/annual-reports/2017_Annual_Report_ENGLISH-WEB.pdf

Qatar Airways Annual Report Fiscal. (2019). retrieved from, https://www.qatarairways.com/content/dam/documents/annual-reports/2019/ENG_Annual_Report_2019_V2.pdf

Qatar Airways Sustainability Report. (2018). retrieved from, https://www.qatarairways.com/content/dam/documents/environmental/sustainability-report-2018.pdf

Rad, S. T., & Gülmez, Y. S. (2017). Green logistics for sustainability. *International Journal of Management Economics & Business*, *13*(3), 603-614.

Seroka-Stolka, O. (2014). The development of green logistics for implementation sustainable development strategy in companies. *Procedia-Social and Behavioral Sciences*, *151*, 302-309. https://doi.org/10.1016/j.sbspro.2014.10.028.

Straková, J. (2015). Sustainable value added as we do not know it. *Verslas: teorija ir praktika*, *16*(2), 168-173. https://doi.org/10.3846/btp.2015.453.

Teixeira, C. R. B., Assumpção, A. L., Correa, A. L., Savi, A. F., & Prates, G. A. (2018). The contribution of green logistics and sustainable purchasing for green supply chain management. *Independent Journal of Management & Production*, *9*(3), 1002-1026. https://doi.org/10.14807/ijmp.v9i3.789.

The Emirates Group Annual Report. (2017-2018). retrieved from, https://c.ekstatic.net/ecl/documents/environmental-reports/environment-report-2017-18.pdf

The Emirates Group Annual Report. (2018-2019). retrieved from, https://cdn.ek.aero/downloads/ek/pdfs/report/annual_report_2020.pdf

Turkish Airlines Annual Report. (2017). retrieved from, https://investor.turkishairlines.com/documents/ThyInvestorRelations/Annual_Report_2017.pdf

Turkish Airlines Annual Report. (2018). retrieved from, https://investor.turkishairlines.com/documents/ThyInvestorRelations/THY__FRAE__2018_ENG_v2.pdf

Turkish Airlines Sustainability Report. (2017). retrieved from, https://investor.turkishairlines.com/documents/sustainability/surdur20172.pdf

Turkish Airlines Sustainability Report. (2018). retrieved from, https://investor.turkishairlines.com/documents/surdurulebilirlik/thy-sustainability-report_compressed.pdf

Turkish Airlines Sustainability Report. (2019). retrieved from, https://investor.turkishairlines.com/documents/sustainability/surdurulebilirlik-raporu-ingilizce.pdf

Upham, P., Thomas, C., Gillingwater, D., & Raper, D. (2003). Environmental capacity and airport operations: Current issues and future prospects. *Journal of Air Transport Management*, *9*(3), 145-151.

UPS Annual Report. (2017). Retrieved from, https://investors.ups.com/_assets/_02f17fb091ddd047d12c09ca530683ec/ups/db/1175/9917/annual_report/2017_UPS_Annual_Report.pdf

UPS Annual Report. (2018). Retrieved from, https://investors.ups.com/_assets/_02f17fb091ddd047d12c09ca530683ec/ups/db/1175/9918/annual_report/62967_UPS_AnnualReport_WEB.pdf

UPS Annual Report. (2019). Retrieved from, https://investors.ups.com/_assets/_02f17fb091ddd047d12c09ca530683ec/ups/db/1175/9919/annual_report/2019_UPS_Annual_Report.pdf

UPS Social Impact Reporting. (2020) retrieved from https://about.ups.com/us/en/social-impact/reporting.html

WATS (World Air Transport Statistics). (2020). Retrieved from, https://www.iata.org/en/publications/store/world-air-transport-statistics/

WCED. (1987). https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf

Yüksel, Filiz & Araci, Hakan. (2016). Sürdürülebilirlik Performansının Ölçülmesi: Bist Sürdürülebilirlik Endeksindeki İşletmelerin Sürdürülebilir Katma Değerinin Hesaplanması Measurement of sustaınabılıty performance: Calculatıon of sustainable added value of business in bist sustainability index.

Journal of Sustainable Development of Transport and Logistics (ISSN: 2520-2979) is published by **Scientific Publishing House "CSR", Poland, EU** and **Scientific Publishing House "SciView", Poland, EU**
Publishing with JSDTL ensures:
• Immediate, universal access to your article on publication
• High visibility and discoverability via the JSDTL website
• Rapid publication
• Guaranteed legacy preservation of your article
• Discounts and waivers for authors in developing regions
Submit your manuscript to a JSDTL at https://jsdtl.sciview.net/ or submit.jsdtl@sciview.net