



CO₂ Emission Reporting of Maritime and Air Transport in the Context of Sustainable Development

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Article history

Received 28.05.2022
Accepted 28.09.2022
Available online 26.10.2022

Keywords

sustainability
transport
CO₂ emissions
financial reporting

Abstract

The transport industry, and especially aviation and maritime transport, emits significant amounts of CO₂, adversely affecting the environment. The Sustainable Development Goals not only indicate the need to reduce CO₂ emissions, but also to provide access to information on the amount of emissions, on top of their environmental and financial impacts. The main source of this type of information is found in financial and non-financial statements prepared by entities of the transport sector. CO₂ reporting disclosures should be subject to the principle of true and fair view ensuring adequate materiality, transparency and comparability of information. The aim of the article is to assess the scope and method of reporting information on CO₂ emissions in the financial and non-financial statements of selected groups of the air and maritime transport sector. By means of content analysis, disclosures on this subject were reviewed and compared against the applicable legal regulations in the field of CO₂ emissions reporting for the industry. The results of the research indicate a significant differentiation in the methods of reporting, in particular relating to the valuation and presentation of CO₂ emission allowances in reports on the financial position in air transport and the manner and scope of reporting non-financial information in maritime transport. The obtained results indicate insufficient comparability of the reported information and a need for harmonisation of the provisions of law regarding the scope and forms of reporting. The findings also indicate a need to combine financial and non-financial information in single reports in order to properly interpret the effects of emissions.

DOI: 10.30657/pea.2022.28.47

JEL: L51, M21

1. Introduction

Greenhouse gas emissions, in particular CO₂, are becoming an increasingly larger and more urgent problem to be solved in the modern global economy. Sustainable development requires halting environmental degradation (Mebratu, 1998). It is crucial to identify and monitor the largest CO₂ emitters and force them to take action to reduce emissions. The pressure on such entities should be twofold. On the one hand, appropriate legal regulations should be implemented, and on the other, society should demand effective action in reducing emissions from CO₂ emitting companies. The basis of sustainable development is high social awareness built on access to information. The concept of sustainable development is often combined with the concept of corporate social responsibility in the context of the responsibility of an organization for the impact of it is decisions and activities on society and the environment on top of the need to disclose information in this regard (Střihavková et al., 2021; Szadzińska et al., 2021). However,

the industry has lacked a unified policy and common understanding of how to define and measure sustainability (Zieba and Johansson, 2022), which has led to inconsistent sustainability reporting practices. The basic source of verifiable financial information is found in financial statements, which are prepared by enterprises in the rigor of accounting and auditing law. Some emitters may be required to publish only non-financial information, while others must report financial information including asset, equity and performance consequences. The second of these cases concerns those entities that cover the current emissions with acquired CO₂ emission allowances. Significant CO₂ emitters include European maritime and aviation entities, which are examples of a wide differentiation in CO₂ emissions reporting.

Financial statements provide a source of information for shareholders of aviation and maritime companies about the financial condition of these entities and also about the performance of managers, e.g., in terms of sustainable development.

International Accounting Standards and International Financial Reporting Standards (IAS/IFRS) allow for high discretion in the presentation of financial information on CO₂ emission allowances and their valuation in statements of financial position, which may hinder their correct interpretation and comparability. On the other hand, non-financial statements required by the Directive of the European Parliament and of the Council (Directive 2014/95/EU) are characterized by a diversity of scope and form.

In this context, the question arises as to whether, on the basis of the applicable law, a coherent, logical and substantive model for reporting financial and non-financial information on CO₂ emissions can be identified in European maritime and air transport. The aim of this article is to assess the manner and scope of reporting information on CO₂ emissions in groups of the air and maritime industry from the point of view of the true and fair view principle and sustainable development goals.

The structure of the article corresponds to the achievement of its objective. The first part presents the importance of CO₂ emissions in the context of sustainable development. The second part of the article provides a diagnosis of the problem of CO₂ emissions in maritime and aviation entities against the applicable legal regulations in addition to a literature review. This section also sets out the requirements for financial and non-financial reporting of CO₂ emissions. The third part contains the results of an analysis of financial and non-financial reports of selected in maritime and aviation entities, which are the largest emitters of CO₂ in the territory of the European Economic Area. The last part provides a summary and conclusions together with recommendations for changes in legal regulations in the field of disclosure and reporting of CO₂ emissions

2. The importance of CO₂ emissions in the concept of sustainable development

The literature indicates a universally recognized definition of sustainable development (SD) that is part of the Our Common Future United Nations Report from 1987. The document was the result of the work of the independent World Commission on Environment and Development established in 1983. According to the report, “sustainable development is development that meets the needs of the present without compromising the possibilities of future generations to meet their own needs” (UN Report, 1987). The literature contains opinions that the concept of sustainable development is perceived and interpreted differently, which makes it ambiguous in its assessments (e.g., Mebratu, 1998; Zieba and Johansson, 2022; Lélé, 1991; Zadrożniak, 2015).

The basic document for the establishment of sustainable development is General Assembly Resolution A/RES/70/1: 2030 Agenda for Sustainable Development is currently in force signed by 172 countries, including Poland (UN Resolution 70/1, 2015).

Sustainable development issues focus on three levels: environmental, economic and social. They are defined in detail by means of the adopted Sustainable Development Goals (“SDG”). Of the 17 general, primary goals, the largest group

is constituted by objectives that are directly or indirectly linked to the environment: SDGs 7, 9, 12, 13, 14, 15 (UN Resolution 70/1, 2015). From the point of view of this article, SDG 13 is particularly important, which was formulated as follows: “Take urgent action to combat climate change and its impacts”. In the description of this objective, the level of greenhouse gas emissions was pointed out as the main problem, while the tasks of Agenda 2030 emphasize the need to drastically reduce greenhouse gas emissions, especially CO₂. Objective 9 highlights sustainable industrialization and the promotion of innovation, while Objective 12 refers to sustainable consumption and production patterns. This is linked to a responsibly organized and developed infrastructure, in particular transport. In particular, SDG 12 contains such tasks as:

- Task SDG 12.6, according to which companies, especially large and international enterprises, should be encouraged to implement sustainability practices and to include information on this subject in their periodic reports,
- Task SDG 12.8, which should ensure that the community has access to relevant information and raises people’s awareness of sustainable development.

The above mentioned objectives call for a significant reduction in CO₂ emissions in the coming years, thereby putting appropriate pressure on gas emitters. A prerequisite for the effectiveness of the latter is that the international community has access to adequate information on the scale, financial implications of CO₂ emissions and the polluters’ measures taken to reduce them. This implies the need for reliable and transparent reporting of financial and non-financial information in the reports prepared by these entities, especially concerned with costs (Biernacki, 2014).

3. Experimental

The article contains the results of research carried out using a qualitative method, based on the content analysis of legal provisions and case studies on selected CO₂ emitters. In an in-depth analysis of legal acts, the authors limited themselves to the legal regulations in force in the European Economic Area.

The conducted case studies concerned financial statements and non-financial statements for 2021 or 2020 (in the absence of reports for 2021) of aviation entities, which were subject to the obligation to include CO₂ emission allowances in financial reports. The research sample covered the largest airlines in terms of CO₂ emissions in the EU (EEA, 2019):

- RYANAIR (headquarters in Ireland)
- EASY JET (headquarters in the UK)
- LUFTHANSA (headquarters in Germany)
- BRITISH AIRWAYS (headquarters in the United Kingdom),
- WIZZAIR (registered office in Hungary)

By conducting an in-depth qualitative analysis of their consolidated financial and non-financial statements, the following issues were examined:

- the presentation of CO₂ emission rights in the consolidated statement of financial position (quantitative and value),

- information on the principles of valuation of CO₂ emission rights acquired and received free of charge in consolidated statements of financial position,
- disclosures concerning the provisioning of shortages of CO₂ emission allowances in the consolidated statement of financial position,
- the scope of disclosures in the non-financial statements.

For maritime transport entities not covered by the obligation to hold and account for CO₂ emission allowances, the scope of disclosures in the non-financial reports of the following EU-based entities, recognized as the world's leading shipowners, were analysed. (TOP 10 ranking of the largest shipowners, 2021):

- A.P. Moller – Maersk (headquarters in Denmark)
- Mediterranean Shipping Company S.A. (MSC) (headquarters in Switzerland and Italy)
- CMA CGM (headquarters in France)

4. Diagnosis of the problem of CO₂ emissions in maritime and air transport

According to statistics, transport is a significant source of CO₂ emissions. For example, in 2018, transport generated about 25% of all emissions in the European Union. Similarly, high shares of CO₂ emissions from transport in the total emissions (27%) were recorded in the UK in 2019 (U.S. Environmental Protection Agency) and in the United States in 2020 (Transport and Environment Statistics 2021 Annual Report). According to the European Commission's data for 2017, 13.9% of CO₂ emissions from transport are generated by aviation, which also accounts for 3.8% of emissions worldwide (European Commission – Aviation). The value of the share of CO₂ emissions from maritime transport has been estimated at 2.5% of CO₂ emissions worldwide (European Commission – Shipping sector, European Maritime Transport Environmental Report 2021). The issue of the negative impact of CO₂ emissions from air and sea transport on the environment has been the subject of many scientific studies (Klopott, 2016; Škorupa et al., 2018; Lawrence, 2009; Hassan et al., 2018; Dube and Namu, 2019; Terrenoire et al., 2019; Anger, 2010; Mersin et al., 2019; Škorupa et al., 2018).

As a result of the analysis of legal regulations aimed at preventing unsustainable CO₂ emissions, it should be noted that the legal obligations for air and maritime transport sectors are not equal. As part of the European Economic Area, air transport has been integrated into the European Union Emissions Trading System (“EU-ETS”) since 2012 (Directive 2008/101/EC). It covers all flights starting or ending within the European Economic Area. In Poland, greenhouse gas emissions from the aviation sector are covered by local law in the form of the Act of 12 June 2015 on the greenhouse gas emission allowance trading system.

Since 2016, activities limiting the impact of CO₂ emissions from the aviation sector on sustainable development have also been carried out at the global level within the International Civil Aviation Organization. The Carbon Offsetting and Reduction Scheme for International Aviation aims to offset, by

purchasing certificates, all remaining emissions from the aviation sector that exceed the carbon dioxide emissions of the base year 2019. The scheme has been piloted since 2021 and is based on the need to have emission allowances similar to the EU ETS (CORSA).

According to the legal regulations, aircraft operators should have annual emission monitoring plans approved by the designated authorities in a given Member State. In addition, aviation sector entities are required to report CO₂ emissions data annually to the competent authorities. Attention should be paid to the high level of detail of the reported data containing, among others: tons of CO₂ emissions and types of fuel used for each aircraft, country of departure and arrival, and number of flights per a pair of airports. Each report prepared for a given year must be verified by an authorized external entity.

Although the European Commission has recognized the problem of CO₂ emissions in maritime transport for a long time, only since 2018 the possibility of treating maritime transport like other emission sectors is being considered, including the proposal to incorporate shipping emissions in the EU Emissions Trading System, as evidenced by the mention in directive which refers to the obligation from the European Council of October 2014 for all sectors of the economy: “to reduce the overall greenhouse gas emissions of the Union by at least 40% below 1990 levels by 2030 (Directive (EU) 2018/410).

In accordance with the regulations of the European Commission, marine operators only from 2019 onwards must also prepare annual positively verified emission reports for each ship that carried out maritime transport activities in the European Economic Area (Regulation (EU) 2015/757).

Therefore, it should be emphasized that only aircraft operators (qualified for the EU ETS) are obliged to cover CO₂ emissions with appropriate allowances, which they are able to obtain through:

- purchase of allowances by auction (A),
- free allocation of allowances (B),
- applying to the relevant authority for the issue of allowances from the special reserve (R),
- the acquisition of allowances on the market.

The differentiated opportunities to acquire allowances result from the fact that approximately 82% of aviation allowances are received under the free pool, 15% are sold as part of auction, and some are kept as a reserve for new entities, so operators are forced to purchase allowances from entities from other sectors, e.g., energy (EEA, 2019).

It should be noted that the legal status described above, which maintains the diverse treatment of greenhouse gas emissions from different modes of transport, is in contradiction with Sustainable Development Goals, in particular with Task SDG 12.8, on the need to provide the community with access to relevant information. Emissions reports prepared according to the templates resulting from the European Union directives are submitted to exclusively to state authorities and cannot be subject to analysis by the broadly understood public.

5. Financial and nonfinancial reporting of CO₂ emissions

Where greenhouse gas emitters are entities of the EU ETS, they are obliged to present data on their allowances and emissions in their financial statements. The financial statement is a basic source of information for shareholders, investors, contractors, employees, etc. It should be prepared in accordance with the overarching concept of accounting, which is: “the true and fair view principle”, which in practice means preparing the report in such a way and to the extent that it reflects clearly and fairly the financial and property situation of the entity (IAS/IFRS; Houghton, 1987; Financial Reporting Council 2014; McGee, 1991). The rules for the preparation of financial statements include International Accounting Standards and International Financial Reporting Standards (“IAS/IFRS”), which do not indicate a uniform template for the reporting of acquired CO₂ emission rights and their settlement. The detailed IFRIC Interpretation 3 Emission Rights was also released, however, it is still in the development and modification phase, so it is not binding.

Entities preparing financial statements in accordance with IAS/IFRS are free to classify and present acquired emission rights on their balance sheet and to make provisions for them. This also applies to accepted valuation principles and models.

In the light of IFRIC 3, acquired CO₂ emission allowances are, in principle, intangible assets, and therefore they are subject to IAS 38, Intangible Assets (IAS/IFRS). They are not subject to depreciation, but their carrying amount is verified by an impairment test in accordance with IAS 36, Impairment of Assets (IAS/IFRS). Entitlements acquired by the entity due to the adopted balance sheet classification have an initial value in the form of the purchase price. The IFRIC 3 principles also do not preclude the use of other options for the classification of acquired CO₂ emission rights. Their basis is the purpose of acquiring these rights. Emission rights allocated (free of charge) may be recognized as government grants and accounted for in accordance with IAS 20, government grants and disclosure of government assistance (IAS/IFRS). If an entity acquires rights for resale, it may recognize them as an inventory item and measure them in accordance with IAS 2, Inventories. Also, this is in accordance with this Standard to classify rights to be surrendered for the purpose of accounting for actual CO₂ emissions as a raw material with reference to provisions for the cost of manufacturing the product. Another solution that falls within the limits set out in IAS 1 is to show

emission rights as a separate item of fixed assets or current assets.

The provision for emission allowances in the part covered by purchased rights should be created at the purchase cost. The provision for the part not covered by the held or due entitlements is created in the amount of the purchase prices of the contracted entitlements or at the market price at the balance sheet date.

IAS/IFRS allow different arrangements for the presentation of information on CO₂ emission allowances and their use in the business of an entity. As a result, this makes it difficult or impossible for users of the reports who do not have access to accounting and to compare data on this subject.

The literature contains critical voices of the scope of CO₂ reporting required by IAS/IFRS and postulating the need to introduce solutions to maintain the comparability of published information (Reizinger-Ducsai, 2007, Rathee and Kapil, 2015, Haigh and Shapiro, 2012, Montenero et al., 2021). Research carried out on companies of the Warsaw Stock Exchange showed significant differentiation in the way CO₂ emission allowances are reported and valued (Strojek-Filus and Sulik-Górecka, 2022). The issue of disclosure of CO₂ emissions in the financial statements of aviation entities is the subject of academic research. For example, the impact of IFRS on the reporting of CO₂ costs in aviation was analysed by Tuck-Riggs (2015). One can also find proposal models for valuation an organization’s non-current carbon emission allowances in the literature (Ratnatunga et al., 2011).

Non-financial reporting is subject to Directive 2014/95/EU. This regulation also includes information on CO₂ emissions. However, it is worth emphasizing various types of non-financial statements: sustainability report, CSR report, integrated report, as well as a report on the activities of the management board. The information on CO₂ emissions should include both financial and non-financial data in order to facilitate its proper compilation and interpretation.

6. Results and discussion

In order to assess the compliance of the scope of a disclosure with the IAS/IFRS requirements, the CO₂ allowance data published in the consolidated financial statements for the years 2019-2021 (in the absence of reports for 2021) of the largest aviation sector entities in terms of CO₂ emissions in the EU were analysed. The results are presented in Table 1.

Table 1. Disclosures of CO₂ emission in financial reports and non-financial reports of selected aviation entities

No	Entity	Disclosures in non-financial reports		Disclosures in financial reports	
		Sustainable Development Goals for reducing CO ₂ emissions	CO ₂ emissions data	Rules for the presentation and valuation of CO ₂ emission rights	Reserves for shortages of CO ₂ emission allowances
1	RYAN-AIR	to reduce CO ₂ per revenue passenger kilometre (RPK) to below 60 grams by 2030; to become the first Airline Group to publish its CO ₂ statistics monthly; to achieve net carbon zero by 2050;	In 2020, the Ryanair Group emitted 5.0 million t CO ₂ (2019: 13.08 million t CO ₂), which equates to 0.25 t CO ₂ (2019: 0.086 t CO ₂) per passenger	Ryanair recognizes the cost associated with the purchase of carbon credits as part of the EU-ETS as an expense in the income statement No valuable data	The Group’s fuel risk management policy includes hedging of the Group’s EU-ETS (carbon) exposures

2	EASY JET	tackling carbon emissions; stimulating carbon innovation and going beyond carbon No specific numerical goals except for: net zero carbon emissions by 2050	No quantitative data on the total number of tons of CO ₂ Only CO ₂ emissions per passenger kilometre: 2021: 81.08 pkm, 2020: 70.77 pkm	Purchased carbon credits are recognized at the purchase price. Neither purchased nor free credits are subsequently revalued as they are held for own use. Carbon assets are derecognized when they are used to settle the ETS liabilities. These assets are presented as current intangible assets and are reviewed for impairment annually. In 2021 125 million £ (EU and UK ETS permits), £6 million in 2020.	As part of the commitment to voluntary carbon offsetting, easyJet currently has contractual commitments to purchase Verified Emission Reductions worth £11 million (2020: £29 million) in total until December 2022
3	LUFTHANSA	lack of clear value-defined targets	CO ₂ emissions in 2021 increased by 20% to 13.7 million tons (previous year: 11.4 million tons) Specific CO ₂ emissions per passenger-kilometre were 3% lower than in the previous year at 101.6 grammes (previous year: 105.2 grammes)	Emissions certificates are recognized as intangible assets and presented under other receivables. Rights, both those purchased and those allocated free of charge, are measured at cost and not amortized. No value data	A provision for the obligation to submit CO ₂ emissions certificates is recognized for an amount equivalent to the carrying amount of the capitalized CO ₂ certificates. the amount of the provision is measured using the market price of the emissions certificates as of the reporting date. (20 million Euro – 2021, 50 million Euro-2020)
4	BRITISH AIRWAYS	to deliver about a third of emissions reductions by 2050, further third of emission reductions will come from switching to sustainable aviation fuel, meeting about 50% of our fuel needs by 2050	Direct emissions associated with operations including use of jet fuel, diesel, petrol, natural gas, and halon 2019: 19.047.278 t CO ₂ 2020: 7.250.236 t CO ₂ Indirect emissions associated with key products and services 2019: 5.535.880 t CO ₂ 2020: 2.108.930 t CO ₂	Purchased emissions allowances are recognized at cost. Emissions allowances are not revalued or amortized but are tested for impairment whenever indicators exist that the carrying value may not be recoverable. 2020: 27 million £, 2019: £36 million. As at 31 December 2020, the value of emission allowances sale and repurchase agreements was £33 million.	Other provisions include a provision for the EU Emissions Trading Scheme that represents the excess of BA's CO ₂ emitted on a flight within the EU in excess of the EU Emission Allowances granted.
5	WIZZAIR	to be the most sustainable airline on the planet, in 2030 goal of reducing emission intensity to 43 grams per RPK down from 57.2g CO ₂ per RPK in F20 (1 CO ₂ per revenue passenger kilometre (CO ₂ /RPK) reduction)	Direct emissions 2020: 3.783.901 Tons CO ₂ 2019: 3.310.219 t CO ₂ Indirect: n.m. not meaningful	The Group follows the "cost method" of booking the allowances: the free allowances have nil cost value so therefore are not recognized as an asset; allowances purchased in the market are recorded at the purchase price in inventory: 2021: 33.5 million Euro 2020: 50.8 million Euro.	no such information provided

Source: Own elaboration based on financial reports and non-financial reports: Ryanair Annual Report 2021, EasyJet Annual Report and Accounts 2021, Lufthansa Group Annual Report 2021, British Airways Plc Annual Report and Accounts Year ended 31 December 2020, Wizzair Holdings PLC Annual Report and Accounts 2021

As a result of the analysis of the financial and non-financial reports of the surveyed entities, it should be noted that no financial report contains information on the total number of tons of CO₂ emitted. These data are available in the non-financial information section on environmental impacts. In the case of Lufthansa and British Airways, this information is published separately in the so-called sustainability reports, which are published on the entities' websites, other than the financial statements. The remaining data is dispersed and does not exhaust the requirements of IAS/IFRS. For example, according to European Commission data, Ryanair is the only company on the list of Europe's top 10 CO₂ emitters that does not have a coal-fired power plant. (BBC, 2019). Despite this, Ryanair's financial statements contain few disclosures on CO₂ allowances. Presenting data at a highly aggregated level does not allow any useful information to be found. The information that the costs of purchasing allowances are recognized in the Income Statement and not in Balance Sheet is ambiguous, as this

is in contradiction with IAS/IFRS regulations. There is also no information on making provisions for allowance shortage. The only quantitative data on CO₂ emissions is published in the non-financial information section.

Easy Jet is the only airline which, in addition to covering its emissions with EU ETS allowances, is also a participant in CORSIA. The value of CORSIA carbon offsetting VERs in 2021 was 15 million £. The reports of the other airlines surveyed do not contain any information on participation in CORSIA. Neither the financial statements nor the non-financial statements of easyJet contain data on total quantitative CO₂ emissions. In the non-financial part, there is only information about CO₂ emissions per passenger kilometre. Lufthansa's financial statements do not include information on the value of CO₂ emission allowances held. In contrast, it is the only one of the entities surveyed that disclosed the value of the provisions made. A mention of provisioning is made in the British Airways report, but there is no value data. British

Airways, meanwhile, has revealed revenue figures from the sale of emissions allowances, due to the recession in aviation in 2020 caused by the Covid pandemic. The transaction contributed to the increase in group's financial results in 2020. British Airways has also demonstrated liabilities for having to repurchase these emissions in 2021. In 2020 WIZZAIR sold

some purchase options linked to emission allowances and, during 2021 the Group recognized net €2.5 million gain (2020: €1.4 million loss) under financial expenses.

The second part of the study analyses non-financial information on CO₂ emissions in selected corporations including maritime transport. The results of the analysis are presented in

Table 2. Reported information on CO₂ emissions in non-financial statements of selected maritime transport groups

No.	Entity	Sustainable development objectives	CO ₂ emissions data
1	Mediterranean Shipping Company S.A (MSC)	The objectives are described in a clear way, although visual effects (photos, drawings, etc.) are used intensively. MSC is a member of the Getting to Zero Coalition and is working with partners to achieve zero emissions powered by zero emission fuels into operation by 2030.	It is presented that in 2020, MSC Cargo recorded a 44.3% reduction in their emissions (against a 2008 baseline). There is a lack of concrete quantitative data on the level of actual emissions in 2020. There is also no link between emissions impacts and financial information. Only a few percentages are given in the report. In the section on CO ₂ emissions, the MSC Carbon Calculator is given, which according to the report is in line with the Clean Cargo recommendations and is based on the latest values of MSC's 2020 scorecard, which is supposed to provide a standard calculation per container ship introduced.
2	A.P. Moller – Maersk	The report is structured and clear. Environmental information is displayed appropriately. Visual effects are not overused. The corporation stresses that its priority is to support the transition to a net zero economy by eliminating emissions in transport and logistic sector. Strategic targets: 2040: Net zero across the business, 100% green solutions to customers, 2030: Aligned with the Science Based Targets initiative 1.5°C pathway, Industry-leading green customer offerings across the supply chain. Overview of all the ESG categories: climate change and environment and ecosystems (incl. ship recycling)	The report presents quantitative data on CO ₂ emissions in an appropriate comparative context. Transport and logistics emit 3.5 billion tons of CO ₂ every year. Maersk currently contributes about 1% of this total – nearly 0.1% of global emissions. The report shows detailed information on the quantity and structure of CO ₂ emissions by means of an appropriate map in combination with a presentation of the specific measures taken to reduce CO ₂ . The data presented are compared year-on-year. There is a lack of linkage of this information to financial information to facilitate interpretation of the data. A road map to deliver net zero by 2040 is presented: net zero-across transport business and 100% green solutions to customers. Presented decarbonization solutions include an Emissions Dashboard, which empowers customers to measure their carbon footprints across Maersk-controlled and non-Maersk controlled logistics.
3	CMA GGM	The group stresses that although maritime transport is still by far the solution that produces the least greenhouse gas emissions per ton of merchandise transported, reducing energy consumption has always been one of the group's core concerns. The report presents CO ₂ emission targets within the framework of sustainable development: carbon neutral by 2050, -50% in g CO ₂ /TEU-km by 2030 compared to 2008, and at least 10% of alternative fuels in our energy mix by 2030.	The report provides both general and detailed information on current CO ₂ emissions. The corporation has reduced CO ₂ emissions per teu-km by 49% between 2008 and 2020. Group reports voluntary target of reducing greenhouse gas emissions by 50% by 2030. Carbon emissions per container fell by 2.5% with respect to 2019 at 1.12 ton of CO ₂ /TEUs loaded. The report presents comparative data with an indication of the structure of emissions by area of activity. It does not contain any combination of non-financial information with selected financial information in order to facilitate the interpretation of the issue results presented. As an example of effort and intensity in this direction, an LNG (liquefied natural gas)-powered vessel emits up to 20% less CO ₂ than a regular oil-powered system in 2020. The Group has opted to use LNG to power its new vessels and to reducing air pollution, LNG produces up to 20% less CO ₂ emissions than traditional marine fuel.

Source: Own elaboration based on non-financial reports: CMA CGM Sustainable Development Report 2020, MAERSK Sustainability Report 2021, MSC Group Sustainability Report 2021

As it results from the analysis carried out in Table 2, there are important differences regarding the reporting of information on CO₂ emissions and their impacts. The three surveyed groups in the maritime transport sector produce the same type of non-financial reports, namely the Sustainability Report. Therefore, one would expect them to report information on CO₂ emissions in a similar way. However, the analysis shows significant differentiation in the type, scope and level of detail of the information presented. In only one case, comparative data from the previous year was presented. General information on emission reductions achieved in previous years and information on intentions and plans, referring to SDG 13, dominate. This second group of information is illustrated by a map of activities up to 2050. There is little information on actual, current emissions and a tonnage-based conversion factor is used, which may make it difficult for users of the report to assess this as a group. The low contribution of maritime transport to global emissions is also highlighted. It is worth noting that none of the analysed reports introduced

selected financial information to facilitate the interpretation of non-financial data (e.g., quantitative). The research conducted by Płoska and Próchniak (2017) on 37 Baltic ports shows that the most frequently reported area of social responsibility in the reports of these entities (except for one port in Stralsund) is the environment. However, emphasizing the importance of this area must be accompanied not only by a sequence of appropriate pro-environmental measures, but also by the appropriate quality of the information presented on the current state, i.e., the scale and effects of environmental pollution.

Air transport entities, despite being subject to the obligation to hold CO₂ emission allowances and to present disclosures about these allowances in their financial statements in accordance with IAS/IFRS, do not comply with this obligation. Stakeholders looking for information about an entity's CO₂ emissions and sustainable development activities find it very difficult to find complete and comparable data. First, this is due to insufficiently detailed IAS/IFRS guidelines as has been stressed in the literature (Reizinger-Ducsai, 2007; Rathee and

Kapil, 2015; Haigh and Shapiro, 2012; Montenero et al., 2021). The analysis conducted confirms the conclusions of previous studies of aviation entities by, among others, Tuck-Riggs (2015), who concluded that regulatory intervention is necessary for the disclosure of CO₂ emissions by polluters if they are to take responsibility for their actions in sustainable development. As Ratnatunga (2011) noted, the need to value CO₂ allowances as intangible assets is a difficult issue, requiring more precise explanation in IAS/IFRS.

In addition, it should be stressed that the results of the study show that the managements of the airlines are not keen to inform shareholders accurately about the volumes and values of emissions, as well as the value of the allowances held or the amount of provisions created. This is confirmed by the scant information provided in the non-financial reports of both in maritime and aviation entities..

7. Summary and conclusion

The global transport sector is one of the largest emitters of CO₂ globally. Admittedly, it is not homogeneous in terms of the scale of emissions, and consequently there are sub-sectors with very high emissions, such as air transport, and those with much lower global emissions, such as maritime transport. However, the largest emitters are global corporations, often combining different areas of transport activity. From the point of view of the concept and objectives of sustainable development, such entities should be subject not only to control stemming from the regulatory sphere but also to social control. This in turn requires constant access to financial and non-financial information on the level and impact of CO₂ emissions. Such access should be ensured through financial and non-financial reports drawn up by the transport operators guaranteeing the quality of such information, in particular its comparability. Comparability is essential to assess the impact and scale of CO₂ emissions across the industry spectrum.

However, the considerable latitude in presenting this information in practice can make comparisons difficult. According to the study, aviation groups show, for example, CO₂ emission allowances under various headings in the consolidated statements of their financial position and, in one case, directly under costs. The lack of adequate explanations on this subject may lead to misinterpretations on the part of the users of the reports, in particular society. It seems justified to unify solutions concerning both the reporting presentation and the valuation of CO₂ emission allowances and provisions related to them.

Maritime transport operators report information on emissions in non-financial accounts. The generic diversity of non-financial reports translates into the scope, degree of detail and form of information presented. The research shows that even within a single type of report there are large differences in the way and type of information presented. Information about the ambitious intentions of actors is mixed with information about CO₂ reduction achievements, which in practice can obscure the most important information about current emissions. These, in turn, when appropriately generalized or given

against global emissions without an appropriate industry comparison, can be downplayed or difficult to grasp for the user of the report. In this context, it seems necessary to harmonize, at a legislative level, the manner and scope of reporting non-financial information on CO₂ emissions and to link it with financial information in order to facilitate the assessment of the situation. In this respect, integrated reports can be an advantageous solution, but they are not often used.

A limitation of the research conducted was the relatively small number of entities studied, although they represented the largest global groups. It is also limited to sea and air transport. In the next stage of the research, we intend to include the other transport areas and smaller players in the regional cross-section as well. The period of the COVID-19 pandemic and the war in Ukraine have caused some "regrouping" in the area of global and regional transport, which translates into the importance of reported information on CO₂ emissions.

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海运和空运的二氧化碳排放报告 在可持续发展的背景下

關鍵詞

可持续性
运输
二氧化碳排放量
财务报告

摘要

运输业，尤其是航空和海运业，排放大量二氧化碳，对环境产生不利影响。可持续发展目标不仅表明需要减少二氧化碳排放量，而且还提供有关排放量信息的途径，以及它们对环境和财务的影响。此类信息的主要来源是运输部门实体编制的财务和非财务报表。二氧化碳报告披露应遵循真实公正的原则，确保信息的充分重要性、透明度和可比性。本文的目的是评估在选定的航空和海运部门的财务和非财务报表中报告二氧化碳排放信息的范围和方法。通过内容分析，对该主题的披露进行了审查，并与行业二氧化碳排放报告领域的适用法律法规进行了比较。研究表明，报告方法存在显著差异，特别是与航空运输财务状况报告中二氧化碳排放限额的估值和列报以及非财务信息报告的方式和范围有关。海洋运输。所得结果表明报告信息的可比性不足，需要统一有关报告范围和形式的法律规定。调查结果还表明，需要将财务和非财务信息结合在单一报告中，以便正确解释排放的影响。
