Sustainability practices for SDGs: a study of Brazilian ports

Darliane Ribeiro Cunha[1] · Newton Narciso Pereira[2] · Marcelo de Santana Porte[3] ·
Cauê Ramos Campos[2]

Abstract
One of the main challenges facing ports is reducing social and environmental impacts and integrating sustainability into their core business practices. Ports must make explicit moves toward publishing their policies and contributions to the low carbon economy in their reports. In 2015, the United Nations adopted a global action plan for sustainable development known as Agenda 2030. It contains 17 Sustainable Development Goals (SDGs) and calls for global cooperation between governments, businesses, and civilian organizations to achieve these shared sustainable goals. This article seeks to identify sustainability practices for SDGs using content analysis on reports published by Brazilian Public Port Authorities between 2017 and 2020. Our study sampled ten port authorities that manage seventeen ports, which handled 76% of all national cargo shipments in 2021. This study is exploratory and descriptive research that involves qualitative analysis aided by Iramuteq analysis software. We concluded that the port authority reports mostly cited SDG 8 (Providing Decent Work and Economic Growth), SDG 11 (Creating Sustainable Cities and Communities), and SDG 14 (Protecting Aquatic/Marine Life) for the analyzed period. In practice, SDGs became a part of the port authority discussion agenda as of 2018. Only four of the ten port authorities, we evaluated reported on the SDG topic in 2020. As per the reports, SDG actions at most Brazilian ports are still incipient.

✉ Darliane Ribeiro Cunha
darliane.cunha@ufma.br

Newton Narciso Pereira
newtonpereira@id.uff.br

Marcelo de Santana Porte
marcelo.porte@ufrn.br

Cauê Ramos Campos
caueramos@id.uff.br

[1] Department of Accounting and Management, Federal University of Maranhão, São Luís, Brazil

[2] School of Industrial Engineering Metallurgical at Volta Redonda, Federal Fluminense University, Rio de Janeiro, Brazil

[3] Department of Accounting Sciences, Federal University of Rio Grande do Norte, Natal, Brazil

1 Introduction

Several interest groups demand that social and environmental aspects be considered critical variables for understanding company performance and strategic position. Until recently, concern over these business activity aspects has been limited to a small group of companies (Cunha & Moneva, 2018).

Increased awareness of the importance of sustainability has led to a new business scenario where many substantial companies now publish sustainability reports. KPMG is one of the world's leading professional services firms and the fastest-growing Big Four accounting firm in the USA. The company conducts surveys on sustainability reports annually. The results of the study show that 96% of the 250 largest companies in the world, according to Forbes (G250), and 80% of all large companies worldwide (N100) published Corporate Social Responsibility (CSR) reports in 2020. In 2015, the respective percentages were 92% and 73% (KPMG, 2020).

The Global Reporting Initiative (GRI) is an outstanding initiative that represents long-term international cases for participating stakeholders with the mission of developing and disseminating voluntary reference sustainability guides. KPMG states that GRI is the global standard for sustainability reporting (KPMG, 2020).

Following trends set by other large companies, the maritime sector and port authorities now use GRI standards when publishing their sustainability reports. On 42 differently sized maritime companies of different types, most surveyed companies used GRI guidelines, while half used the GRI-G4 model. Studies suggest that the maritime sector has fallen behind in CSR engagement and its non-financial information disclosures (Karagiannis et al., 2022).

Some ports used GRI guidelines to frame environmental practices in their sustainability reports. 67% of the surveyed ports in Europe, 50% of the surveyed ports in North America, and 42% of the surveyed ports in the Asia-Pacific region prepared annual sustainability reports. Additionally, sustainability reporting among EU ports is increasing, especially among EcoPort members (Hossain et al., 2021).

Linking company strategies with Sustainable Development Goals (SDGs) are a growing trend, along with publishing sustainability practices according to international guidelines.

Added SDG information in sustainability reports grew expressively among the companies surveyed by KPMG. In 2020, 72% of all companies comprising the G250 group had included SDGs in their reporting; in 2017, this percentage was 43%. Increases were also observed among N100 companies. In 2020, reporting percentages were 69%, while in 2017, they were only 39%. However, the N100 group shows more expressive participation from the Japanese at 96%, followed by the Germans at 94%, and the French at 78%, relative to 2020 (KPMG, 2020), when analyzing country by country.

While some companies have started incorporating SDGs into their reports, SDGs still need to be shared with companies' corporate social responsibility language. Furthermore, there is a lack of empirical studies showing evidence of SDGs being true priorities for companies (Ike et al., 2019; Rosati & Faria, 2019).

The port sector has been under pressure recently to implement global-level sustainability practices. Ports have undertaken several initiatives to reduce CO_2 emissions and operational noise, manage waste, and supply green energy to ships (Cepeda et al., 2019; Enguix et al., 2019; Farcas et al., 2020; Vaneeckhaute & Ali Fazli, 2020; Al-Enazi et al., 2021). Some actions are directly related to the SDGs (Wang et al., 2020).

One way to increase port transparency on sustainability actions is to analyze the content of publicly available port authority reports (Santos et al., 2016; Hossain et al., 2019) since these reports may contain information on company actions.

This paper seeks to identify sustainability practices concerning SDGs, using content analysis aided by the Iramuteq software program, by analyzing reports published by Brazilian port authorities from 2017 to 2020 to verify any SDGs employed at Brazilian ports and how these may have evolved.

2 Literature review

A global proposal from the United Nations (UN), known as the 2030 agenda, contains 17 Sustainable Development Goals (SDGs) released in 2015. The SDGs require global action among governments, businesses, and societal organizations to achieve shared prosperity and sustainability goals (Khaled et al., 2021).

The maritime industry plays a relevant role in achieving the SDGs in the three pillars of sustainability. In the social pillar, the industry must support gender equality and empower women through a global program and initiatives aimed at enabling women to work in the sector. The health and well-being of employees are critical issues in the shipbuilding industry. The sector should work to minimize environmental impacts by reducing pollution associated with maritime transport in oceans, ports, and coastal areas. Additionally, it should promote the financing, research, and development of clean energy technologies for the maritime sector (IMO, 2017).

Although several studies have shown that sustainability is practiced within the port sector, only some studies link sustainability practices to SDGs within the port sector and the maritime industry. Some studies focus on specific SDGs (Neumann et al., 2017; Virto, 2018; Wang et al., 2020; Cavalli et al., 2021; MacNeil et al., 2022). Furthermore, initiatives seem to have been more prominent in developed countries (Alamoush et al., 2021[b]) relative to developing countries like Brazil.

For example, SDG 14 is focused on coastal areas and increased human and environmental pressures on coastal areas significantly impact coastal systems, meaning that many coastal areas worldwide require urgent attention (Neumann et al., 2017). The importance of healthy oceans in achieving sustainability. Environmental impacts compromise the ocean's capacity for providing economic, social, and environmental benefits and highlight the over-exploitation of sea resources, pollution, invasive species, habitat destruction, and climate change (Virto, 2018).

The maritime industry plays an important role in meeting the three pillar SDGs. In social terms, industries must support gender equality and empower women through global initiatives and activities to improve the workplace. It is worth mentioning that maritime navigation is an important job-creating industry, especially in developing countries. Health-related issues and employee well-being are central themes within the maritime industry. In environmental terms, this sector should help minimize environmental impacts by reducing maritime-transport-related pollution in oceans, ports, and coastal regions. Additionally, the sector should promote financing, research, and development in clean energy solutions (IMO, 2017).

Wang et al. (2020) studied 40 global container shipping companies and terminal operators. The results state that the maritime industry is mainly responsible for providing a safe and healthy working environment (SDG 8), developing green technologies and

transportation infrastructure (SDG 9), conducting responsible waste management and ship recycling (SDG 12), and adequately managing port waterways and protecting coastal ecosystems (SDG 14). In terms of ship emissions, the ports have been implementing decabornisation measures to mitigate climate change by reducing greenhouse gas (GHC) emissions (Alamoush et al., 2022). GHC reduction is related directly to Goal 13 (actions to mitigate climate change) at port terminals. However, some actions have been proposed to reduce the ship speed and use of alternative fuels (Marques et al., 2022) and shore power while berthing operations in port terminals (Daniel et al., 2022).

A pilot technology model for the port of Livorno to design new port management and operational planning models and to implement sustainable growth port policies to reach the 17 targets set out in the 2030 Agenda (Cavalli et al., 2021).

MacNeil et al. (2022) identified links between the United Nations SDG targets for the Canadian port sector and Green Marine Environmental Program (GMEP) performance indicators. The results indicate significant gaps in the GMEP since only 14 of the 36 SDG targets are directly linked to the program.

3 Methodology and data

We conducted an exploratory and descriptive field study. We identified port reports using the following priority criteria: Sustainability Reports (SR); Integrated Reports (IR); and Annual Reports (RA); when these were not available, we sought Environmental Reports (ER) and Management Reports (MR), published on Brazilian public port websites. The reports were obtained from port websites from 12/01/21 to 01/10/22.

The Brazilian port sector comprises 37 public ports, 19 managed by a Union of Dock Companies, which act as Port Authorities. The other 18 ports are managed by States or Municipalities via specific laws (Sousa et al., 2020). The Cachoeira do Sul, and Estrela ports must provide information on their websites.

The study population comprised 20 port authorities managing 35 ports, as is shown in Table 1. We considered one report per port authority following the priority mentioned above criteria. We obtained and analyzed the reports from 2017 to 2020.

SCPAR port authority reports were excluded from the sample as the Iramuteq software can only parse files in text format. The file format available from the SCPAR port authority on the internet does not allow for turning the file into text.

It is important to note that despite the decrease in the sample, considering that the sustainability report is voluntary, the sample considered port authorities that manage the most critical Brazilian public ports and that handled more than 76% of total national cargo shipments as of 2021 23 reports from the ten port authorities were analyzed. Seven are from 2017, six from 2018, three from 2019, and seven from 2020 (Table 2).

We conducted content analysis for twenty-three reports from ten port authorities in the sample, seven from 2017, six from 2018, three from 2019, and seven from 2020. In the first stage, we highlighted and obtained texts and tables containing the words Sustainable Development Goals, with the SDG abbreviation in sustainability reports or equivalent reports (Table 3). Only four port authorities were considered here since only these ports mentioned SDG or "sustainable development goals."

In the second stage, we highlighted the sustainability practices that port authorities had adopted and how they helped achieve the SDGs by defining the SDGs within the

Table 1 Population of Brazilian public ports reports

Port Authority	Port Names	Region	Years			
			2020	2019	2018	2017
APPA	*Antonina* *Paranaguá*	South	MR	–	–	–
CDC	*Fortaleza*	Northeast	–	–	–	IR
CDP	*Belém* *Santarém* *Vila do Conde*	North	–	–	–	–
CDRJ	*Rio de Janeiro* *Angra dos Reis* *Itaguaí* *Niterói*	Southeast	MR	MR	MR	AR
CDSA	*Macapá*	North	–	–	–	–
CDSS	*São Sebastião*	Southeast	–	–	–	–
CODEBA	*Aratu* *Ilhéus* *Salvador*	Northeast	SR	–	ER	ER
CODERN	*Natal* *Areia Branca* *Maceió*	Northeast	-	–	–	–
CODESA	*Vitória* *Barra do Riacho*	Southeast	–	–	ER	ER
COMAP	*Forno*	Southeast	–	–	–	–
DOCAS-PB	*Cabedelo*	Northeast	–	–	–	AR
EMAP	*Itaqui*	Northeast	SR	–	SR	–
PORTO DO RECIFE	*Recife*	Northeast	SR	–	–	–
PORTOS RS	*Rio Grande* *Pelotas* *Porto Alegre*	South	–	–	–	–
SCPAR	*Imbituba* *São Francisco do Sul* *Laguna*	South	SR	SR	SR	SR
SNPH	*Manaus*	North	–	–	–	–
SOPH-RO	*Porto Velho*	North	–	–	–	–
SPA	*Santos*	Southeast	SR	SR	AR	AR
SPI	*Itajaí*	South	–	–	–	–
SUAPE	*Suape*	Northeast	IR	SR	SR	SR

SR sustainability reports, *IR* integrated reports, *AR* annual reports, *ER* environmental reports, *MR* management reports

port sector (Table 4), choosing keywords related to SDGs (Table 5), and analyzing the 2020 reports. At this stage, seven reports from port authorities were considered.

Table 3 details the 17 SDGs and maritime industry actions toward meeting the SDGs, as presented by Wang et al. (2020) and IMO (2017).

We adopted a model proposed by Wang et al. (2020) to select SDGs with greater relationships to the ports. The authors state that four SDGs (8, 9, 12, and 14) are more

Table 2 Ports studied

Item	Port authority	Ports	Port movement	%
1	APPA	*Paranaguá*	51,606,027.99	12.62
		Antonina	1,479,581.42	0.36
2	CDC	*Fortaleza*	4,835,723.41	1.18
3	CDRJ	*Rio de Janeiro*	10,540,467.88	2.58
		Angra dos Reis	18,922.28	0.00
		Itaguaí	51,723,244.07	12.65
		Niterói	76,419.70	0.02
4	CODEBA	*Aratu*	7,365,247.75	1.80
		Ilhéus	464,591.07	0.11
		Salvador	5,582,340.21	1.37
5	CODESA	*Vitória*	8,214,691.41	2.01
		Barra do Riacho	–	0
6	DOCAS-PB	*Cabedelo*	1,307,328.95	0.32
7	EMAP	*Itaqui*	31,025,618.94	7.59
8	*Porto do Recife*	*Recife*	1,294,604.38	0.32
9	SPA	*Santos*	113,279,536.97	27.71
10	Suape	*Suape*	22,079,407.80	5.40
	Total		310,893,754.23	76.04

aligned with the core business activities of maritime companies and port operations, constituting their primary sustainability responsibilities.

In addition to the indicators proposed by Wang et al. (2020), three SDGs were included related to access to clean energy (SDG 7), sustainable cities and communities (SDG 11), and actions to combat global climate change (SDG 13), which are highly relevant for ports.

To define the keywords, we consulted studies by Sullivan et al. (2018) and Wang et al. (2020).

Working with Iramuteq, it will be possible to interconnect the data through the term triangulation, defined in the study by Creswell and Clark (2015). The triangulation will be performed through lexical analysis associated with descriptive statistical analysis of the words associated with the SDGs of the sample sustainability reports and inference from the Iramuteq system to aid in content analysis.

Lexical and keyword analysis was performed based on Marchand and Ratinaud (2012), using the Iramuteq analysis software program, which organized the texts and generated the Similarity Analysis, allowing us to define the next steps for applying content analysis using an interpretive approach (Pereira et al., 2020).

First, paragraphs with the terms Sustainable Development Goals and SDGs were separated from the sustainability reports, or equivalent reports, for all years.

Second, we created a 'sustainability practices' corpus comprising reports from each company in the sample for 2020. In total, there were seven reports from port authorities published in 2020, resulting in 337,501 words, which contained 12,496 distinct words, and 4,773 words that were mentioned only once. Furthermore, 9,642 active words were identified, along with 2,770 supplementary words.

It is worth noting that the Iramuteq software program only considers words with frequencies equal to or greater than three to perform similarity analysis. Thus, words

Table 3 Role of the maritime industry in achieving the SDGs

	Objective Name	Role of the maritime industry in achieving the SDG's
1	Eradicating poverty	Ensure shipping is safe, secure, and clean-creating prosperity and sustainable growth in a green and blue economies
2	Zero hunger	Ensure efficient and cost-effective supply chains for global food distribution
3	Good health and well-being	Contribute to reducing maritime transport pollution in oceans, ports, and coastal regions
4	Quality education	Safety, security, and environmental protection at sea depend on seafarer education and training
5	Gender equality	Support gender equality and empower women through global programs and activities in the job market
6	Clean water and sanitation	Minimize dumping and waste disposal at sea, which is a critical component in overall waste-management
7	Providing clean and accessible energy	Promote funding, research, and development of clean energy technology for the maritime sector
8	Decent work and economic growth	Seafaring is an essential source of work, especially in developing countries. Issues surrounding seafarers' health and welfare are a central theme of the shipping industry
9	Industry, innovation, and infrastructure	Promote more efficient maritime transportation, via port sector partnerships to drive global stability and sustainable development
10	Reduced inequalities	Increase skills in countries that lack the technical knowledge and resources to operate a safe and efficient shipping industry
11	Sustainable cities and communities	Sustainable cities and communities rely on a secure supply chain. The shipping industry helps to enhance maritime safety and security, which protects the global logistics infrastructure
12	Responsible consumption and production	Reduce waste generation, both operational waste from ships and dumping of wastes at sea
13	Climate action	Control transportation emissions and promote solutions for minimizing air pollution and climate change impacts
14	Life below water	The shipping industry is responsible for global measures to improve the safety and security of international shipping and to prevent pollution from ships
15	Life on land	The shipping industry is responsible for security in ports and is part of global efforts to halt illegal wildlife trafficking
16	Peace, justice, and strong institutions	The shipping industry promotes effective institutions to ensure the safe, secure, and environmentally protective flow of maritime commerce
17	Partnerships for the goals	The IMO has partnerships with Intergovernmental Organizations and Non-Governmental Organization, including leading global environmental organizations

Table 4 Number and Name of SDG

SDG	SDG Name
7	Access to clean energy
8	Decent working conditions and economic growth
9	Industry, infrastructure, and economic growth
11	Sustainable cities and communities
12	responsible production and consumption
13	Actions to combat global climate change
14	Protecting aquatic/marine life

mentioned infrequently in the reports were reported in the Iramuteq reports but did not appear in the similarity analysis.

4 Results

4.1 Direct evidence for the SDGs contained in the reports

When performing the similarity analysis of each report involving the years 2017 to 2020, it can be noted that the frequency of citations of the term Sustainable Development Goals and the acronym SDG in the reports. We observed that port authorities did not report SDGs in 2017. In 2018, only EMAP addressed the topic. In 2019, only the SPA addressed the topic. In 2020, by contrast, SDG was addressed by four port authorities (APPA, CDRJ, SPA, and EMAP). We verified via Similarity Analysis that SDG was discussed more in 2020, mainly by SPA and EMAP.

In 2018, EMAP addressed SDGs in its report. According to the similarity analysis (Fig. 1), *Itaqui*, which EMAP manages, has been trying to fulfill its SDGs and promote sustainable development. However, the results show that its sustainability actions or initiatives do not relate to SDGs or indicators. The port authority also mentioned the following Sustainable Development Objectives: SDG1, SDG6, SDG8, SDG9, SDG10, SDG11, SDG14, SDG15, and SDG17, but did so only once. When the SDG theme was addressed, the port mentioned words like activity, water, life, tradition, and technology. However, the SDGs and cited words did not appear in the similarity tree, given its frequency of less than 3.

In 2019, the similarity tree from the SPA port authority report highlighted topics related to SDGs, which is why the word "correlated" is mentioned in Fig. 2. The most frequent words were a theme, SPA, material, contribution, sustainable, and related.

It can be seen that SPA mentions in its report the importance of the company's dedication to contributing to the SDGs. Unlike the 2018 EMAP report, the SPA report addresses more qualitative information about factors that the company is mapping to meet the UN 2030 agenda. The SPA report addresses the importance of protecting biodiversity, solid effluent management, and water maintenance as significant factors that can affect the health of people who live in cities close to the company.

The port authority also mentioned sustainable development objectives SDG3, SDG6, SDG8, SDG9, SDG11, and SDG14 but did so only once.

Table 5 SDGs and Keywords

| SDG	Keywords
7 Access to clean energy	Energy; Solar; Winder; Hydroelectric
8 Decent working conditions and economic growth	Work; Workers; Health; Well-being; Safety; Accidents
9 Industry, infrastructure, and economic growth	Innovation; Innovators; Technology
11 Sustainable cities and communities	Sustainability; Community; Port-City; Cooperatives; GRI; Citizen
12 Responsible Production and Consumption	Production; Consumptions; SGA; Recycling; Waste; Garbage; Noise
13 Actions to combat Global Climate Change	Climate Change; Control; Emissions; Particulates; Dangerous; Biodiversity; Gas
14 Protecting Aquatic/Marine Life	Trash; Sea; Waste; Oil; Ties; Accidents; Biota
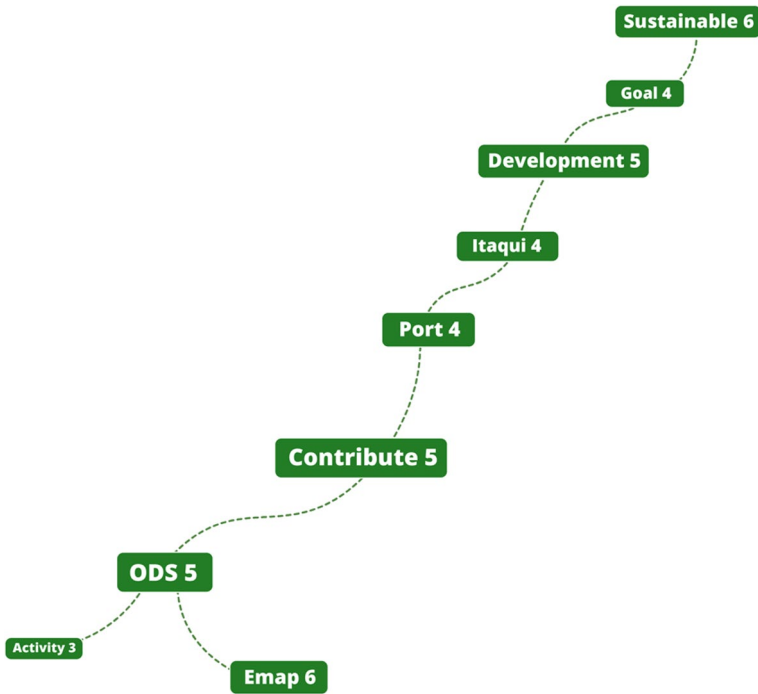
Fig. 1 EMAP similarity analysis for 2018 with the frequency

Figure 3 shows the similarity analysis for the four port authorities. CDRJ and APPA had more restricted similarity trees because they barely addressed SDG in their reports. CDRJ mentioned SDG3, SDG7, SDG8, SDG9, SDG11, and SDG14 but did so only once.

By contrast, SDGs were discussed more by EMAP and SPA, and SPA evolved significantly in 2020 relative to 2019 since it linked SDGs with GRI indicators in 2020, listed its priority themes and connected them with stakeholders.

The most mentioned words by EMAP were EMAP, sustainable, SDGs, development, contribute, objective, activity, promote, port, women, and *Itaqui*. EMAP also mentioned SDG1, SDG4, SDG6, SDG9, SDG10, SDG11, SDG14, SDG15, and SDG17, only once, and SDG8 and SDG5 twice.

SPA had a detailed similarity tree since it prepared a matrix in its report and linked SDGs with GRI indicators for the three sustainability pillars (social, environmental, and economic sustainability). It also highlighted stakeholders related to priority topics and commented on issues related to Global Agreements. We observed that GRI_social, SPA, theme, material, GRI, environmental, law, service, responsible, practical, provider, and employee were the most addressed words in the similarity tree. The port authority gave detailed GRI indicators in the report (201-1, 205-2, 205-3, 203-1, 304-2, 303-1, 303-2, 303-4, 306-1, 306-2, 306-3, 413-1, 403-1, 403-2, 403-3, 403-4, 403-5, 403-6, 403-7, 403-8, 403-9, 403-10); however, we classified the indicators into three groups for the analysis (gri_economic − 200, gri_environmental − 300 and gri_social − 400). SPA also mentioned SDG3, SDG4, SDG9, SDG10, SDG13, SDG15, and SDG16 once, SDG11, SDG12, and SDG14 twice, and SDG8 three times.

Fig. 2 SPA similarity analysis for 2019 with the frequency

With the analysis of the similarity of the reports, it was possible to identify the scarcity of information disclosed about the term SDG. The results of the reports that mention the term SDG are EMAP 2018, SPA 2019 and CDRJ, APPA, EMAP, and SPA, all from 2020. In addition, the data show little linkage of the SDG terms to their indicators and how ports work on them.

Thus, it is clear how late the ports' reports are in terms of the quality of disclosure and standardization of their information on SDGs to be disclosed to their stakeholders. Therefore, there is an urgent need for improvements in their reports so that there is greater transparency of their actions and, therefore, greater compliance of their organizations.

For this reason, it was decided to carry out a second study stage. We highlighted sustainability practices that help achieve the SDG goals in the seven reports published in 2020.

4.2 SDG sustainability practices

Of the 20 port authorities analyzed, according to Table 2, only seven (APPA, CDRJ, CODEBA, EMAP, *Porto do Recife*, SPA and SUAPE) presented 2020 reports that contained information directed at sustainability practices associated with the SDGs (Table 4) and their respective terms evidenced in Table 5.

Figure 4 shows the similarity analysis for the sustainability practices directed toward SDGs at the seven ports analyzed in a single corpus. 2020 was chosen because SDG commentary was non-existent or very limited in previous years, as shown in Figs. 1 and 2.
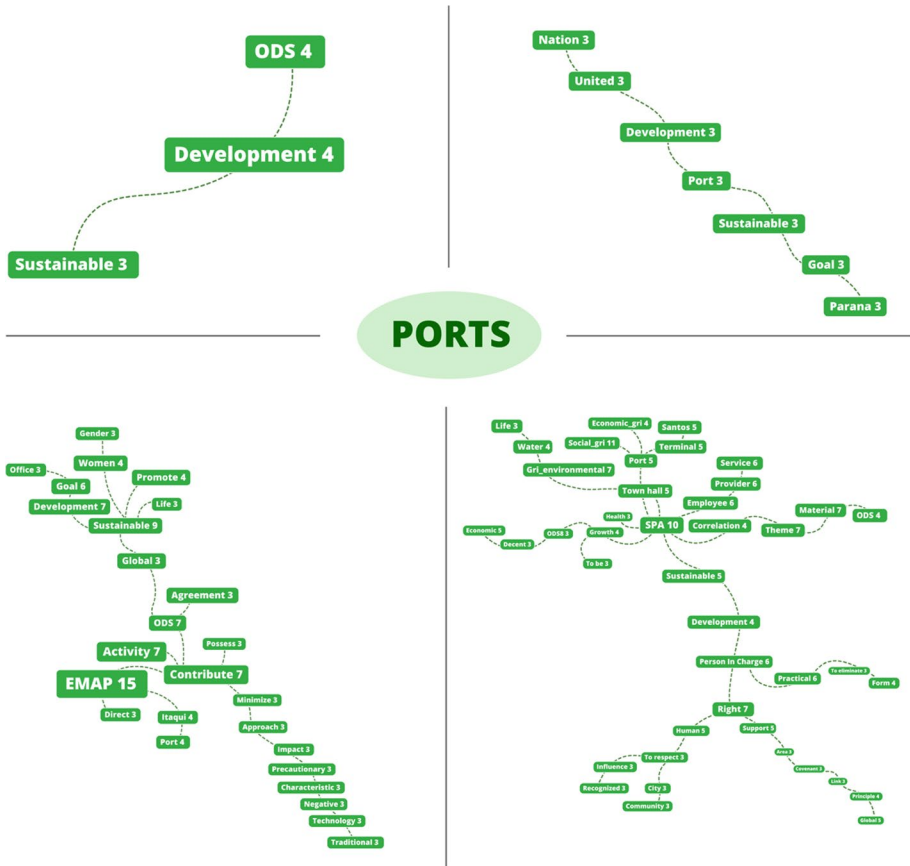
Fig. 3 Similarity analysis of the Ports for 2020 with the frequency (CDRJ-upper left, APPA-upper right, EMAP -lower left and SPA-lower right)

The text corpus comprising the SDG sustainability practices at ports (Fig. 4) is based on graph theory since it connects words and their variations. The Similarity Analysis (Fig. 4) results emphasized 29 words. There was a greater emphasis on control, waste, community, security, sea, emissions, workers, and oil, which appeared more than 100 times in the analyzed reports.

The results point to the ports controlling gas and particulate emission and hazardous waste production, mainly oils and materials that could be recycled, to minimize impacts on biodiversity by supporting sustainability practices related to GRI indicators. Furthermore, there was concern directed toward controlling docking water, garbage at sea, and noise generated at the ports that could affect worker health and safety, anyone close by, and/or the community in general, to improve the port-city relationship.

The ports' Environmental Management Systems (EMS) are initiatives to minimize accidents and promote sustainable development. The EMSs can promote energy efficiency for ports that innovate and invest in technology to promote SDG goals.

Table 6 shows the frequency of the highlighted words in the Similarity Analysis from the highlighted words in Fig. 4. Words like control, waste, community, safety, and health
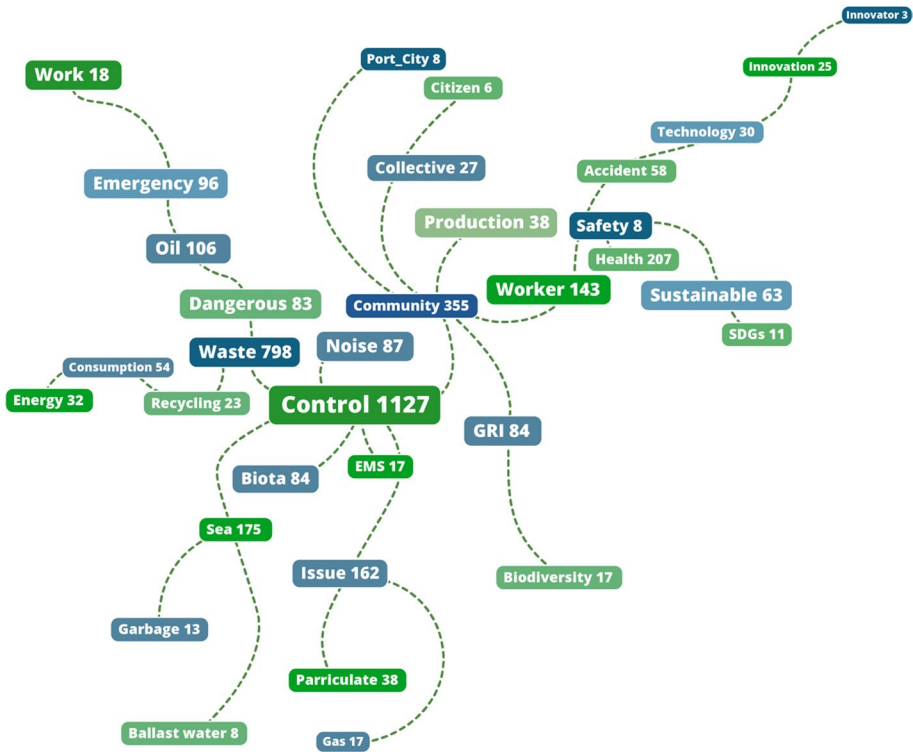
Fig. 4 Similarity Analysis for sustainability practices with the frequency

Table 6 Frequency of highlighted words related to SDGs

Description	Frequency	%
Control	1127	26.66
Waste	798	18.88
Community	355	8.40
Security	215	5.09
Health	207	4.90
Ocean	175	4.14
Emissions	162	3.83
Work	143	3.38
Oil, Emergency, Noise	289	6.84
GRI, Biota, Hazardous, Sustainable, Accident, Consumption	426	10.08
Production, Particulate, Energy, Technology, Collectives, Innovation, Recycling, Work, Gas, SGA, Biodiversity, Garbage, SDG, Ballast Water, Port_Citizen, Citizen, Innovation	330	7.81

were most cited in the port authority reports. By contrast, words like SDG, harbor water, port-city, citizen, and innovator were the least cited in the reports.

4.2.1 SDG 7

SDG 7 promotes financing, research, and development for clean energy technologies in the maritime sector.

We identified that only three port authorities (EMAP, SPA, SUAPE) have sustainability actions to meet this SDG. Although, at EMAP, this initiative is not directly related to developing clean energy for the sector since solar panels are used at the port. The SPA port authority has already integrated SDG7 principles and is the only Brazilian port with significant clean energy generation. By contrast, more than the capacity for generating renewable energy is needed to meet all the port's demands.

EMAP in Maranhão has a fixed monitoring station at dock 100 (Hi Voll) and monitors air quality 24-7; issues alert when it exceeds legal parameters and is powered using solar panels (EMAP, 2020).

Its energy sustainability actions include a 15 MW clean energy hydroelectric plant. Additionally, it has an 18 km2 area of preserved vegetation around the port, highlighting its commitment to maintaining biodiversity (SPA, 2020).

The Port of Santos sets itself apart relative to other national and international ports because it has its hydroelectric plant, which is operated by the port authority and accounts for a significant part of its electricity supply (SPA, 2020).

The wind component cluster showed essential names in the renewable energy sector, like Danish LM Wind Power, which is the leading supplier of wind components in the world, the Suape wind blade manufacturer, and the Spanish GRI Renewable Industry, a leading European steel manufacturing company that produces towers and flanges for wind farms (SUAPE, 2020).

4.2.2 SDG 8

SDG 8 promotes health and employee well-being. These issues are often addressed in sustainability reports, showing determination to protect the interests of employees, and ensure safe and dignified working environments (Wang et al., 2020).

This issue was addressed most by port authorities in their sustainability reports. All port authorities (APPA, CDRJ, CODEBA, EMAP, *Porto do Recife*, SPA, and SUAPE) that published reports in 2020 mentioned sustainability initiatives related to SDG 8, mainly at CODEBA and SPA, which mentioned several initiatives related to training, monitoring, and occupational health. EMAP and the *Porto do Recife* emphasized aspects related mainly to employee training and safety. SUAPE highlighted that it is seeking out good practices. CDRJ mentioned expanding its integrated security system.

EMAP highlighted that it has an Occupational Health and Safety Management System (EMAP, 2020). The *Porto do Recife* stated that health and safety training is conducted to raise awareness and train employees (Porto do Recife, 2020). APPA highlighted contracting an external auditor to examine documents related to environmental quality levels and medical and occupational safety actions (APPA, 2020).

CODEBA mentioned environmental management training programs that address administrative and operational practices for protecting the environment and worker health and safety. It also highlighted an integrated control and monitoring program that keeps animals

out of the port environment to avoid spreading diseases among port workers and to keep loads intact (CODEBA, 2020).

There was an uninterrupted Occupational Health and Safety Management program at the Port of *Santos* that ensured that immediate actions to eliminate and/or mitigate risks in the event of accidents, emergencies, and other occurrences were adopted, which influences the lives and health of all who work there (SPA, 2020). SPA has an Occupational Medicine sector dedicated to promoting public policies focused on occupational health for the port community (SPA, 2020).

Periodically, SPA carries out awareness campaigns to prevent accidents and work-related risks by communicating accidents to the Occupational Health and Safety sector (SPA, 2020).

SUAPE mentioned that it uses Benchmarking with reference ports to improve its Health and Safety at Work Policy and conducts research to adapt *Suape* to good practices in the area. It also highlighted several ongoing actions to ensure worker health and safety, e.g., an Environmental Risk Prevention Program and an Occupational Medical Health Control Program. (SUAPE, 2020).

The expanded Integrated Security System allowed them to increase port security by monitoring internal warehouses, loads, and docking areas, leading to greater control over vessels that dock and providing technical solutions to customs at the Port of *Rio de Janeiro*. Monitoring cameras were installed at strategic locations in *Guanabara* Bay to improve visibility and increase access to port channels (CDRJ, 2020).

4.2.3 SDG 9

The maritime industry helps build a sustainable maritime ecosystem by investing in logistics infrastructure to alleviate transportation barriers while dedicating efforts to innovative ship, terminal, and operating system designs to increase operational efficiency (Wang et al., 2020). SDG 9 promotes efficient maritime transportation, partnership with port sectors, and ports cited partnerships to promote innovation and automate tasks. APPA and SUAPE released plans for this SDG, which are detailed tools for optimizing port operations.

In 2020, *Paraná* Port signed an agreement with the *Valencia* Port Foundation, research, innovation, and training center for port logistics, from the port of *Valencia*, Spain, which operates in various parts of the world. Among many projects, already, underway was building a Port Community System (PCS), a data exchange platform for the port community. The PCS connects multiple systems that different organizations use to integrate information from an entire logistics chain. The partnership also allows for Collaborative Port Decision Making, which proposes a new real-time model for managing maritime operations for all ship arrivals and departures. Furthermore, the partnership discusses digital security and data protection technology issues and Strategic Port Management Training (APPA, 2020).

The SuapeGeo Project introduced new technologies to manage the *Suape* territory better. It is a platform comprising an arrangement of geoprocessing and geolocation tools to collect, manage, analyze, and share geographic information. These technologies support activities, studies, technical reports, and decision-making at the managerial and planning levels based on geographic and statistical data for characterizing and monitoring the *Suape* territory (SUAPE, 2020).

Suape entered into an agreement process with *Pernambuco* Pilots, a company responsible for simulation services via the implementation of the ReDraft software program. The tool will provide daily reports combining data from a meteorological station and sensors

installed at the port. This system will allow maximum draft meter gains for ship entries and exits. This parameter changes static drafts to dynamic drafts, allowing for operational gains using real-time technology and monitoring tools to monitor weather conditions and expand docking time frames for ships with drafts larger than established drafts. The port will be able to handle more cargo per ship with greater drafts, increasing port volumes (SUAPE, 2020).

4.2.4 SDG 11

SDG 11 promotes sustainable cities and communities via a secure supply chain. Four port authorities addressed this topic (CODEBA, EMAP, SPA, and SUAPE) in the reports. More specifically, they expressed concern for the Port-City relationship.

CODEBA, in Bahia State, had a Social Communication Program and a Support Program for Fishing Communities in 2020 (CODEBA, 2020).

EMAP stated that it has an Environmental Management System focused on five principles, including the desire to support socio-environmental practices that positively impact the local ecosystem and the surrounding communities near the Port of *Itaqui*, to promote the port-city relationship as a strategic planning part of the port authority, highlighting the fourth pillar of strategic port planning, called the "Porto-City Relationship," corresponding to no less than a quarter of the strategic planning for the port sector (EMAP, 2020).

The Port-City seal was launched as a symbol of the port community, which began to be used by SPA, other companies, and other institutions linked to the port sector in *Baixada Santista* to signal the port's solidarity in events and projects aimed at strengthening the Port-City relationship. Since 2010, SPA has promoted socio-environmental actions in the region via an Environmental Education Program linked to its Port Operating License. They began via a Participatory Socio-environmental Diagnosis that identified socio-environmental conflicts, challenges, and eight potential communities that could be impacted by port activities (SPA, 2020).

It is worth mentioning that the SUAPE maintains a cooperation agreement with United Nations Educational, Scientific and *Cultural* Organization for a Geopark. The Geopark frames the *Parque Metropolitano Armando de Holanda Cavalcanti* as a geological heritage site that is scientifically important and rare, thereby expressing integrated protection, education, and sustainable development (SUAPE, 2020).

They state that they are firmly advancing their corporate governance via their large ecological preservation area representing 59% of *Suape*'s industrial port complex. They reaffirm their commitment to a green and sustainable agenda by combining economic development with environmental protection (SUAPE, 2020).

4.2.5 SDG 12

SDG 12 reduces operational waste from ships and waste dumping at sea. Only four ports (APPA, EMAP, SPA, and SUAPE) had explicit actions for this SDG. APPA and SUAPE mentioned that they provide courses to help reduce waste, EMAP highlighted selective collection programs, and SPA mentioned establishing procedures for their entire port community.

Waste is separated via a selective collection program at EMAP, which was already implemented at the Port of *Itaqui*. All companies operating in the port area are required to participate. The company mentions three waste segregation objectives: reducing hazardous

waste volumes that will be treated or disposed of. In 2019, a conscientious consumption campaign was launched to reduce water, paper, plastic, energy consumption, and waste generation (EMAP, 2020).

SPA has expanded details on existing diagnoses to integrate waste management procedures among all port participants. The *Santos* Zero Waste Association raises awareness of the importance of correctly reducing waste and disposing of it (SPA, 2020).

Suape holds a course on Solid Waste Management to train high-level technical elements on solid waste management and teach how the topic is dealt with within the company (SUAPE, 2020). Similarly, APPA highlighted 34 training sessions related to their solid waste management program (APPA, 2020).

4.2.6 SDG 13

SDG 13 controls emissions coming from the transportation sector and offers solutions to minimize air pollution from the transportation sector and its impact on climate change. It is worth highlighting that no port authority mentioned actions to minimize climate change impacts. Only CODEBA and SPA highlighted actions about SDG 13 in the analyzed reports.

A monthly Atmospheric Emissions Management Program was implemented to control black smoke emissions from trucks using the Ringelmann scale and monitoring the particulate matter. Corrective maintenance actions are recommended for non-conforming vehicles (black smoke monitoring). There were also audits to verify atmospheric emission management processes (CODEBA, 2020).

In addition to actions performed by SPA, port terminals also monitor emissions standards for effluents in their areas and maintenance activities for the drainage systems in compliance with their environmental licenses. Any generated information is regularly reported to the Port Authority, and if any deviations are identified in the parameters, cause analysis is performed, and preventive or corrective measures are adopted (SPA, 2020).

4.2.7 SDG 14

SDG 14 states that the shipping industry must be responsible for taking global measures to improve the safety and security of international shipping and to prevent ship pollution. Virto (2018) stated that port logistics could significantly impact SDG 14, focusing on preserving oceans, seas, and marine resources.

The port authorities (CODEBA, EMAP, SPA, and SUAPE) highlighted actions related to SDG 14 in the reports. CODEBA highlighted several initiatives and contingency waste, water monitoring, sediment monitoring, and aquatic biota monitoring plans to protect oceans and the port surroundings. SPA mentioned treating harbor water, and EMAP highlighted controlling aquatic biota.

CODEBA recommended installing tarpaulins or other protective structures between the ships and piers to prevent accidental spills directly into seawater during goods transfers. If docks need to be cleaned/washed using water, absorbent barriers must be used around rainwater drains to prevent waste from directly entering the seawater. Regarding oil spills, the team is trained on Individual Emergency Plans and holds trial runs. Finally, the program monitors water, sediment, and biota quality (CODEBA, 2020).

SPA highlighted controlling and treating docking water. SPA and the other authorities supervise compliance with mandatory procedures for controlling and treating docking

water, either via a specific system on the ship itself or by exchanging water at sea (SPA, 2020). In 2020, SPA acted on 46 incidents, four at sea, 37 involving cleaning and decontamination events, and another five involving other events (SPA, 2020).

EMAP conducts environmental monitoring of aquatic biota, including exotic/invasive species. Monitoring for exotic/invasive species is done by making seawater collections and is not performed on board ships. The biota results are primarily positive, and no invasive species have been found to date (EMAP, 2020).

5 Discussion

Although Brazil has 37 public ports, our study comprised a sample of only ten ports, representing 17 Brazilian ports, since other port authorities did not publish sustainability reports or equivalent reports on their web pages. Our results show that despite SDG topics being included in reports in 2018, we verified that only four ports mentioned SDGs in their reports. We should highlight that only SPA linked SDGs with Global Pact principles and GRI indicators.

The results showed that SDG 8 (Providing Decent Work and Economic Growth), SDG 11 (Creating Sustainable Cities and Communities), and SDG 14 (Protecting Aquatic/Marine Life) were the most cited objectives by the surveyed authorities.

Of all the sustainability initiatives highlighted in the reports, the SPA initiative related to SDG 7 (clean and affordable energy) was the only Brazilian case of significant clean energy generation linked to the port authority. Regarding SDG 9 (industry, innovation, and infrastructure), two port authorities (APPA and SUAPE) released their plans for this SDG, which detailed tools for optimizing port operations.

Using the Iramuteq software, it was possible to compare the sentences in the reports. It was clearly perceived that the ports need to follow a pattern when they mention the indicators that make up the SDGs. In addition to the evident lack of information that the data presented in the report refer to a specific SDG, it was possible to notice that in many cases, there is a mixture in the same sentence with data that make up one or more SDGs together, thus making it difficult to compare the reports.

Fleming et al. (2017) highlight that SDGs are unproven in practice in the private sector, explained mainly by Differences in the language used in the SDGs compared to business language; few successful examples of when SDGs have been successfully adopted, mainly due to the problematic and complex systemic changes required from organizations and society; and few regulatory mechanisms that encourage adoption.

Brazil still needs official ANTAQ terms for adopting and aligning SDGs. Basically, we observed actions that are directly promoted by port authorities in these reports. Brazilian Port authorities and port cities have yet to institutionalize efforts to take climate-adaptive actions. Our results are aligned with Lima and Souza (2022) present that Brazil has effectively addressed the SGD 13 with its Adaptation National Plan, the coastal management framework and primarily port planning both remain uncertain, and port adaptations are based only on a recent national sustainability guideline agenda (Lima & Souza, 2022). In these reports, we could not identify port actions based on SDG 13.

On the other hand, the main contributions in terms are SDG 14 and 12 (Cormier & Elliott, 2017; Virto, 2018; Omer & Noguchi, 2020) in port terminals logistics. In the Brazilian ports evaluated in this study, SDG 12 is cited in 4 ports with a focus on waste reduction and SDG 14 on preventing ship pollution at the port.

One can obtain a broader view of the activities developed at Brazilian ports by linking sustainability practices with SDGs. Wang et al. (2020) highlight that SDGs, a comprehensive sustainability framework, are a practical framework that can unify and disperse sustainability literature.

Sustainable Development Goals are ambitious steps toward sustainable development and offer a much broader vision of sustainability than ever. However, practical challenges remain, including how to implement changes (Fleming et al., 2017).

Alamoush et al. (2021[a]) proposed sustainable port management indicators. They state that ports can directly or indirectly influence all SDGs. Ports need to integrate economic and social aspects with environmental concerns and drive the UN 2030 agenda, internally and externally. Port authorities are now taking a more proactive stance toward promoting green initiatives. Furthermore, ports are becoming innovation ecosystems that drive technological revolutions in the maritime logistics industry (Deloitte, 2021).

6 Conclusion

We concluded that SDG 8 (Providing Decent Work and Economic Growth), SDG 11 (Creating Sustainable Cities and Communities), and SDG 14 (Protecting Aquatic/Marine Life) were most cited by the surveyed authorities over the analyzed period from 17 SDGs proposed by the United Nations.

Our main conclusion is that the SDGs were included in the discussion agenda of port authorities in 2018. Although reports from 2017 exist, this topic still needs to be addressed by any authority. Only four port authorities in 2020 reported on Sustainable Development Goals. It suggested that the Brazilian National Agency and Port authorities insert the SDG in the discussion agenda. Considering that Brazil has 37 public ports, only 10,81% presented SDGs indicators in their public reports, which shows that effective action is necessary to improve the Agenda 2030.

In terms of public ports evaluated, SPA presented a matrix relating SDGs with GRI indicators under three sustainability pillars (social, environmental, and economic sustainability) in its 2020 report. The port authority highlighted priority issues for stakeholders and the principles of the Global Pact. This may indicate that SPA is aligned with sustainable development objectives and realizes the importance of applying these to the port sector, and therefore, is a reference for the sector.

Of all the sustainability initiatives highlighted in the reports, the SPA initiative for SDG 7 (clean and affordable energy) was the only Brazilian case of significant clean energy generation linked to the port authority. Regarding SDG 9 (industry, innovation, and infrastructure), two port authorities (APPA and SUAPE) released plans related to this SDG, detailing tools for optimizing port operations.

The results indicate significant differences in how the reports address the theme, and few ports address this topic in their reports. Therefore, it is extremely important to standardize this information in the reporting of Brazilian ports in line with what has been done in international ports. Then, there is an increase in the qualitative and quantitative quality of SDG information in their reports.

The Brazilian ports receive many international ships that transit through all the globe's continents. Their reports must have global standardization and not just obey the minimum transparency required by the Brazilian market.

To carry out the study, a set of keywords related to the priority SDGs in the port sector was defined. The selection of keywords can be considered a limitation of the study. Therefore, our conclusions are based on reports available for public consultation. This does not mean that other public ports do not carry out actions related to SDGs, but rather that the data were unavailable for consultation during this research period.

Appendix

Appendix A: Acronyms General Terms

ANTAQ	Agência Nacional de Transportes Aquaviários
AR	Annual Reports
CSR	Corporate Social Responsibility
EMS	Environmental Management Systems
ER	Environmental Reports
GHC	Greenhouse Gas
GMEP	Green Marine Environmental Program
GRI	Global Reporting Initiative
IR	Integrated Reports
MR	Management Reports
PCS	Port Community System
SDGs	Sustainable Development Goals
SR	Sustainability Reports
UN	United Nations

Appendix B: Acronyms Port Authorities

APPA	Administração dos Portos de Paranaguá e Antonina
CDC	Companhia Docas do Ceará
CDP	Companhia Docas do Pará
CDRJ	Companhia Docas do Rio de Janeiro
CDSA	Companhia Docas de Santana
CDSS	Companhia Docas São Sebastião
CODEBA	Companhia das Docas Estado da Bahia
CODERN	Companhia Docas do Rio Grande do Norte
CODESA	Companhia Docas do Espirito Santo
COMAP	Companhia Municipal de Administração Portuária
DOCAS-PB	Companhia Docas da Paraíba
EMAP	Empresa Maranhense de Administração Portuária
PORTO DO RECIFE	Autoridade Portuária do Porto do Recife
PORTOS RS	Portos do Rio Grande do Sul
SCPAR	SC Participações e Parcerias
SNPH	Superintendência Estadual de Navegação, Portos e Hidrovias
SOPH-RO	Sociedade Portos e Hidrovias do Estado de *Rondônia*
SPA	Santos Port Authority

APPA	Administração dos Portos de Paranaguá e Antonina
SPI	Superintendência do Porto de Itajaí
SUAPE	Complexo Industrial Portuário de Suape

Declarations

Conflict of interest The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

Al-Enazi, A., Okonkwo, E. C., Bicer, Y., & Al-Ansari, T. (2021). A review of cleaner alternative fuels for maritime transportation. *Energy Reports*, *7*, 1962–1985. https://doi.org/10.1016/j.egyr.2021.03.036.

Alamoush, A., Ballini, F., & Dalaklis, D. (2021). Port sustainable supply chain management framework: Contributing to the United Nations' sustainable development goals. *Maritime Technology and Research., 3*(2), 137–161.

Alamoush, A., Ballini, F., & Ölçer, A. (2021). [b]). Revisiting port sustainability as a foundation for the implementation of the United Nations Sustainable Development Goals (UN SDGs). *Journal of Shipping and Trade*, *6*, 19. https://doi.org/10.1186/s41072-021-00101-6.

Alamoush, A., Ölçer, A., & Ballini, F. (2022). Port greenhouse gas emission reduction: Port and public authorities' implementation schemes. *Research in Transportation Business & Management*, *3*, 100021. https://doi.org/10.1016/j.clscn.2021.100021.

Cavalli, L., Giulia, L., Guerrieri, L., Querci, A., Bari, F., Barbieri, G., Ferrini, S., Di Meglio, R., Cardone, R., Tardo, A., Pagano, P., Tesei, A., & Lattuca, D. (2021). Addressing efficiency and sustainability in the Port of the future with 5G: The experience of the Livorno Port. A methodological insight to measure Innovation Technologies' benefits on Port Operations. *Sustainability*, *13*(21), 12146. https://doi.org/10.3390/su132112146.

Cepeda, M., Pereira, N., Kahn, S., & Caprece, J. D. (2019). A review of the use of LNG versus HFO in maritime industry. *Marine Systems & Ocean Technology*, *14*, 75–84. https://doi.org/10.1007/s40868-019-00059-y.

Creswell, J., & Clark, V. (2015). *Pesquisa de métodos mistos*. São Paulo: Penso Editora.

Cormier, R., & Elliott, M. (2017). SMART marine goals, targets and management–is SDG 14 operational or aspirational, is 'Life below Water' sinking or swimming? *Marine Pollution Bulletin*, *123*(1–2), 28–33. https://doi.org/10.1016/j.marpolbul.2017.07.060.

Cunha, D., & Moneva, J. M. (2018). The elaboration process of the sustainability report: A case study. *Revista Brasileira de Gestão de Negócios., 20*(4), 533–549.

Daniel, H., Trovão, J., & Williams, D. (2022). Shore power as a first step toward shipping decarbonization and related policy impact on a dry bulk cargo carrier. *eTransportation*, *11*, 100150. https://doi.org/10.1016/j.etran.2021.100150

Deloitte (2021). Europe's ports at the crossroads of transitions: A Deloitte and ESPO Study. Available online: https://www.espo.be/media/Deloitte-ESPO%20study%20-%20Europe%E2%80%99s%20ports%20at%20the%20crossroads%20of%20transitions_1.pdf

Enguix, I. F., Egea, M. S., González, A. G., & Serrano, D. A. (2019). Underwater acoustic impulsive noise monitoring in port facilities: Case study of the port of Cartagena. *Sensors (Basel, Switzerland), 19*, 58.

Farcas, A., Powell, C., Brookes, K., & Merchant, N. (2020). Validated shipping noise maps of the Northeast Atlantic. *Science of the Total Environment*, *735*, 139509. https://doi.org/10.1016/j.scitotenv.2020.139509.

Fleming, A., Wise, R. M., Hansen, H., & Sams, L. (2017). The sustainable development goals: A case study. *Marine Policy*, *86*(1), 94–103. https://doi.org/10.1016/j.marpol.2017.09.019.

Hossain, T., Adams, M., & Walker, T. (2019). Sustainability initiatives in canadian ports. *Marine Policy*, *106*, 103519. https://doi.org/10.1016/j.marpol.2019.103519.

Hossain, T., Adams, M., & Walker, T. (2021). Role of sustainability in global seaports. *Ocean and Coastal Management*, *202*, 105435. https://doi.org/10.1016/j.ocecoaman.2020.105435.

Ike, M., Donovan, J., Topple, C., & Masli, E. (2019). The process of selecting and prioritising corporate sustainability issues: Insights for achieving the Sustainable Development Goals. *Journal of Cleaner Production*, *236*, 117661. https://doi.org/10.1016/j.jclepro.2019.117661.

IMO. International Maritime Organization (2017). IMO and sustainable development: how international shipping and the maritime community contribute to sustainable development. Available online: https://www-cdn.imo.org/localresources/en/MediaCentre/HotTopics/Documents/IMO%20SDG%20Brochure.pdf

Karagiannis, I., Vouros, P., Sioutas, N., & Evangelinos, K. (2022). Mapping the maritime CSR agenda: A cross-sectoral materiality analysis of sustainability reporting. *Journal of Cleaner Production*, *338*, 130139. https://doi.org/10.1016/j.jclepro.2021.130139.

KPMG (2020). The KPMG Survey of Sustainability Reporting 2020. Available online: https://assets.kpmg/content/dam/kpmg/xx/pdf/2020/11/the-time-has-come.pdf

Lima, F., & Souza, D. (2022). Climate change, seaports, and coastal management in Brazil: An overview of the policy framework. *Regional Studies in Marine Science., 5*, 52. https://doi.org/10.1016/j.rsma.2022.102365

MacNeil, J., Adams, M., & Walker, T. (2022). Evaluating the efficacy of sustainability initiatives in the canadian Port Sector. *Sustainability*, *13*, 21. https://doi.org/10.3390/su14010373.

Marchand, P., & Ratinaud, P. (2012). L'analyse de similitude appliquée aux corpus textuels: les primaires socialistes pour l'élection présidentielle française (septembre-octobre 2011). Actes des 11eme Journées Internationales d'Analyse Statistique des Données Textuelles. *JADT*. 687–699

Marques, C., Pereda, P., Lucchesi, A., Ramos, R., Fiksdahl, O., Assis, L., Pereira, N., & Caprace, J. (2023). Cost and environmental impact assessment of mandatory speed reduction of maritime fleets. *Marine Policy*, *147*, 105334. https://doi.org/10.1016/j.marpol.2022.105334.

Neumann, B., Ott, K., & Kenchington, R. (2017). Strong sustainability in coastal areas: A conceptual interpretation of SDG 14. *Sustainability Science*, *12*, 1019–1035. https://doi.org/10.1007/s11625-017-0472-y.

Omer, M. A., & Noguchi, T. (2020). A conceptual framework for understanding the contribution of building materials in the achievement of Sustainable Development Goals (SDGs). *Sustainable Cities and Society., 6*, 52. https://doi.org/10.1016/j.scs.2019.101869

Paiva, D., Freitas, M., Barbosa, M., & Pizzolato, N. (2019). Assessing the environmental management and operational efficiency of brazilian public ports that export soybeans. *Revista de Administração Pública, 53*(2), 41. https://doi.org/10.1590/0034-761220170311

Pereira, C., Oliveira, P., & Reis, M. (2020). Processos e metodologias não-tradicionais no Ensino Superior de Engenharia Elétrica: A percepção de coordenadores de curso em dois países lusófonos. *Meta Avaliação, 12*(34), 211–246.

Rosati, F., & Faria, L. (2019). Business contribution to the Sustainable Development Agenda: Organizational factors related to early adoption of SDG reporting. *Corporate Social Responsibility and Environmental Management*. https://doi.org/10.1002/csr.1705.

Santos, S., Rodrigues, L., & Branco, M. (2016). Online sustainability communication practices of european seaports. *Journal of Cleaner Production, 112*(4), 45.

Sousa, E., Kliemann, F., Andriotti, R., & Campagnolo, R. (2020). Avaliação dos portos públicos brasileiros: Gestão baseada em valor. *BBR Brazilian Business Review*, *17*, 439–457. https://doi.org/10.15728/bbr.2020.17.4.5.

Sullivan, K., Thomas, S., & Rosano, M. (2018). Using industrial ecology and strategic management concepts to pursue the Sustainable Development Goals. *Journal of Cleaner Production*, *174*, 237–246. https://doi.org/10.1016/j.jclepro.2017.10.201.

Vaneeckhaute, C., & Fazli, A. (2020). Management of ship-generated food waste and sewage on the Baltic Sea: A review. *Waste Management*, *102*, 12–20. https://doi.org/10.1016/j.wasman.2019.10.030.

Virto, L. (2018). A preliminary assessment of the indicators for sustainable develppment goal (SDG) 14 conserve and sustainably use the oceans, seas and marine resources for sustainable development. *Marine Policy*, *98*, 47–57. https://doi.org/10.1016/j.marpol.2018.08.036.

Wang, X., Yuen, K., Wong, Y., & Li, K. (2020). How can the maritime industry meet Sustainable Development Goals? An analysis of sustainability reports from the social entrepreneurship perspective. *Transportation Research Part D, 5*, 78102173.