PORT AUTONOME DE COTONOU

PORT AUTONOME DE COTONOU (PAC)
Certified:

ISO 140001:2015, ISO 9001:2015 and ISO 45001:2018 by TÜV Rheinland Algeria Sarl;

EcoPorts label by ECO SLC

ENVIRONMENTAL REPORT OF THE PORT OF COTONOU

BIENNIAL REPORT

YEAR : 2023 & 2024

Table of Contents

..... 0
List of tables 2
1 PRESENTATION OF THE PORT OF COTONOU 4
1.1 Description of the Port of Cotonou and its activities 5
1.2 The Port of Cotonou in a figures 7
1.3 Zoning and port activities 9
1.4 Institutional framework 11
1.5 Stakeholders needs and expectations 14
2 ENVIRONMENTAL COMPONENTS MONITORED 15
2.1 Air quality 15
2.1.1 Ambient air 15
2.1.1.1 Carbon monoxide (CO) 16
2.1.1.2 Nitrogen dioxide (NO_2) 17
2.1.1.3 Sulphur dioxide (SO_2) 18
2.1.1.4 Ozone (O_3) 20
2.1.1.5 Particulate matter (PM) 21
2.1.2 Atmospheric deposition (precipitation) 23
2.1.2.1 Heavy metals 24
2.1.2.2 Polycyclic aromatic hydrocarbons (PAHs) 26
2.2 Water quality 27
2.3 Noise 30
2.4 Soil quality 31
2.5 Waste management 32
2.6 Biodiversity management 33
3 MAJOR ENVIRONMENTAL INCIDENTS 34
3.1 The port environmental monitoring platform 34
4 IMS RESULTS (RATE OF ACHIEVEMENT OF ENVIRONMENTAL OBJECTIVES) 35
5 ENVIRONMENTAL ACTIONS AND PROJECTS 36
6 CERTIFICATION ECOPORTS 39
RECOMMENDATIONS 40
ANNEXES 41

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

List of figures

Figure 1. Geostrategic position of the Port of Cotonou. 4
Figure 3. Overview of ship calls in 2023 and 2024 (source PAC, 2023 & 2024). 7
Figure 2. Throughput of goods 2023 and 2024 in tonnage (source PAC, 2023 & 2024). 7
Figure 4. CIP Zoning 9
Figure 5. The structure of the PAC 11
Figure 6. Structure of the PAC Harbour Master's Office - Departments of Land Operations, Safety, Environment and Quality 12
Figure 7. PAC stakeholders 14
Figure 8. Location of air quality monitoring sensors. 16
Figure 9. Average concentration of carbon monoxide in air. 17
Figure 10. Average concentration of nitrogen dioxide in the air. 18
Figure 11. Average concentration of sulphur dioxide in the air. 19
Figure 12. Average concentration of ozone in the air. 21
Figure 13. 8-hour average exceedance O_3 (> 60 PPB) 21
Figure 14. Average PM concentration $_{2.5}$ for 2023-2024 per sensor 22
Figure 15. Average PM_{10} concentration for 2023-2024 per sensor 23
Figure 16. Location of Owen gauges 24
Figure 17. Insoluble heavy metals sum (without Fe) 25
Figure 18. Sum of soluble heavy metals 26
Figure 19. 27
Figure 20. Salinity of the water of the Cotonou port basin. 28
Figure 21. Turbidity of the water in the harbour basin 29
Figure 22. Location of sound measurements 31
Figure 23. IMS-QSE policy of the PAC. 36
Figure 24. PAC EcoPorts Certificate. 39

List of tables

Table 1: Descriptive table of the modernization projects of the Port of Cotonou. 7
Table 2: Averages of insoluble heavy metals 24
Table 3: Soluble heavy metal averages 25
Table 4: Averages of PAHs 26
Table 5: Noise level in the port. 30
Table 6: Update on animals stranded in 2023 and 2024 in the port area. 33
Table 7: Overview of the major environmental incidents recorded in 2023 and 2024 at the port of Cotonou. 34
Table 8: Gap analysis between 2022 and 2024 39
Table 9: Statistics of ship calls as well as the tonnage of goods of the Port of Cotonou. 41
Table 10: Environmental performance of the PAC in 2023. 42
Table 11: Environmental performance of the PAC in 2024. 51

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

List of abbreviations

Abbreviation	*Meaning*
ARMP	Public Procurement Regulatory Authority
CBCT	Cotonou Bulk Cargo Terminal
CHEC	China Harbour Engineering Company
CIP	Cast-in-place
CREC	Entomological Research Center of Cotonou
CSR	Corporate Social Responsibility
DAMPF	Directorate of Maritime, Port and River Affairs
DNCMP	National Directorate of Public Procurement Control
DOPS	Port Operations and Security Directorate
DQHSE	Department of Quality, Health, Safety and Environment
EMS	Environmental Management System
ENABEL	Belgian Development Agency
EPAC	Polytechnic School of Abomey-Calavi
ERAP	Environmental Risk Assessment Plan
HSE	Health, Safety and Environment
IAPH	International Association of Ports and Harbors
IITA	International Institute of Tropical Agriculture
IMS	Integrated Management System
IRD	Research Institute for Development
ISO	International Organization for Standardization
NGO	Non-Governmental Organization
NTU	Nephelometric Turbidity Unit
OHSMS	Occupational Health and Safety Management System
PAC	Autonomous Port of Cotonou
PAH	Polycyclic Aromatic Hydrocarbons
PAP	Project-Affected Persons
PERS	Port Environmental Review System
PM	Particulate Matter
POABI	Port of Antwerp-Bruges International
POPAC	Artisanal Fishing Port of Cotonou
PPB	Parts Per Billion
PPSE	Port Performance & Sustainability Evaluation
PSU	Practical Salinity Units
QMS	Quality Management System
S&ST	Security and Safety Training
SD	Sustainability Department
SDM	Self-diagnosis method
SRSE	Social Responsibility and Environment Department
UMCC	Public Procurement Implementation Unit
VOC	Volatile Organic Compounds

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

1 PRESENTATION OF THE PORT OF COTONOU

Located between the parallels of 6°11' and 6°22' north latitude and 2°26' and 2°30' east longitude, the Port of Cotonou is located on a sandy coast on the southern edge of the city of Cotonou, the economic capital of the Republic of Benin.

Figure 1. Geostrategic position of the Port of Cotonou.

The Port of Cotonou occupies an important place in the economic and historical development of Benin. Officially inaugurated in 1965, the port was established to serve as a critical gateway for trade and connectivity between Benin and the global market. Over the decades, it has played a crucial role in facilitating imports and exports, not only for Benin, but also for several landlocked countries in the region such as Niger, Burkina Faso and Mali. Strategically located on the Gulf of Guinea, the port has undergone several phases of expansion and modernization, evolving from a modest coastal facility to one of West Africa's main commercial hubs. Its development reflects Benin's broader history of trade relations and economic transformation, contributing significantly to regional integration and growth. It ensures 90% of trade with the outside world, generates up to 60% of the Gross Domestic Product and contributes to 45% of tax revenues.

In September 2022, the Port Authority of Cotonou obtained the ***PERS*** (Port Environmental Review System) certification, rewarding its efforts to reduce the environmental impacts of port activities. Thus, the Port of Cotonou had become the second ECOPORTS certified port in Africa.

To obtain this label and its standards, ISO 14001: 2015 certified PA of Cotonou through its environmental management system has carried out numerous actions during the years 2023 and 2024 in various areas, including waste management, monitoring of air and water quality in the port basin, environmental awareness and communication, and among others the prevention of pollution. In addition, environmental indicators had been set up and monitored to assess or evaluate the performance of the Environmental Management System, in order to guarantee its continuous improvement.

As part of its commitment to continuous improvement, the Port Authority of Cotonou actively collaborates with international organizations on a wide range of port development projects

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

that go far beyond environmental management. These collaborations include strategic partnerships with Port *of Antwerp-Bruges International*, a world-renowned port developer, on various operational, commercial and infrastructure improvement projects, as well as with *South Pole*, a leading climate solutions company focused on sustainability and resilience to climate change. These projects are supported by **ENABEL**, the Belgian development agency, as a key financial partner. Through these partnerships, the PAC continues to strengthen its position as a modern, efficient and sustainable port in the region.

1.1 Description of the Port of Cotonou and its activities

The different dimensions of the port of Cotonou are as follows:

- Surface area of the port: 120 ha;
- Limit of the port jurisdiction on land: 1.62 km²;
- Area of the navigable waters of the port: 1.8 km²;
- Offshore port jurisdiction: 12 nautical miles (including compulsory pilotage area, roadstead and anchorage area);
- Total platform: 2,951.73 m;
- Tidal range: - 0.2 to 1.8 m;
- Draft of the largest ship: 13.5 m;
- Maximum draught: 15 m; and
- Length of the largest vessel: 300 m

Business Activities:

☐ Aggregates (sand, gravel, etc.)
☒ Petroleum Product Processing
☐ Chemical industry
☒ Fish market and processing
☒ Refrigerated freight
☒ Ferry Services
☐ Ship construction and repair
☐ Marinas / Leisure
☐ General Manufacturing
☐ Storage and packaging
☒ Cruise Industry

Cargo Handling:

☒ Dry Mass
☒ Car / Vehicle Trading
☒ Petroleum / Petroleum Products
☒ General merchandise
☒ Liquid bulk (non-petroleum)
☒ Perishable products
☒ Ro-Ro

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

- Main cargoes

Oil :

☐ Crude oil
☒ Refined products
☒ LNG (liquefied natural gas)

Minerals :

☐ Bauxite
☒ Charcoal
☐ Iron Ore

Dry bulk:

☐ Animal feed
☒ Chemicals
☐ Cocoa
☐ Coke
☒ Grains
☒ Scrap (iron)
☒ Soybean
☐ Tapioca
☒ Wood
☐ Wood Products

Pyrite Minerals:

☐ Aluminium
☐ Cement
☐ Phosphates
☐ Potash
☐ Pyrites
☒ Sulphur

Liquid bulk (non-petroleum):

☐ Liquid chemicals
☒ Liquefied gases
☒ Perishable liquids
☐ Water

Other :

☒ Cars / Vehicles
☒ Fish
☒ Fruit
☐ Breeding

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

1.2 The Port of Cotonou in a figures

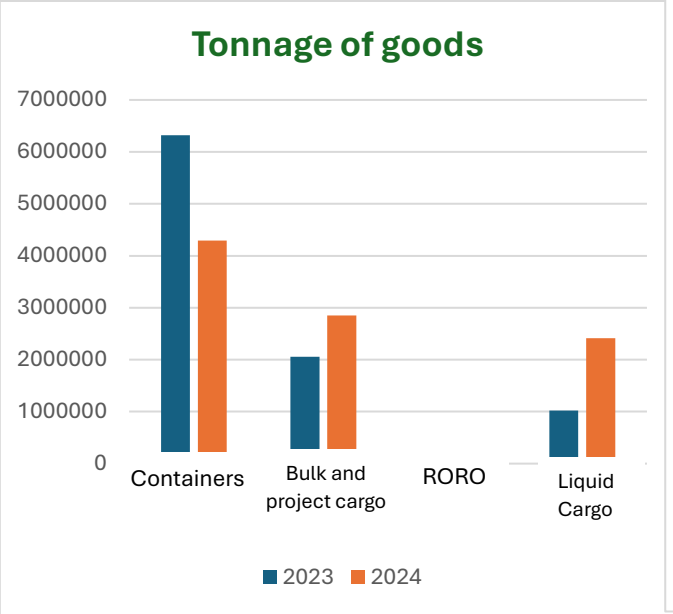


Figure 3. Throughput of goods 2023 and 2024 in tonnage (source PAC, 2023 & 2024).

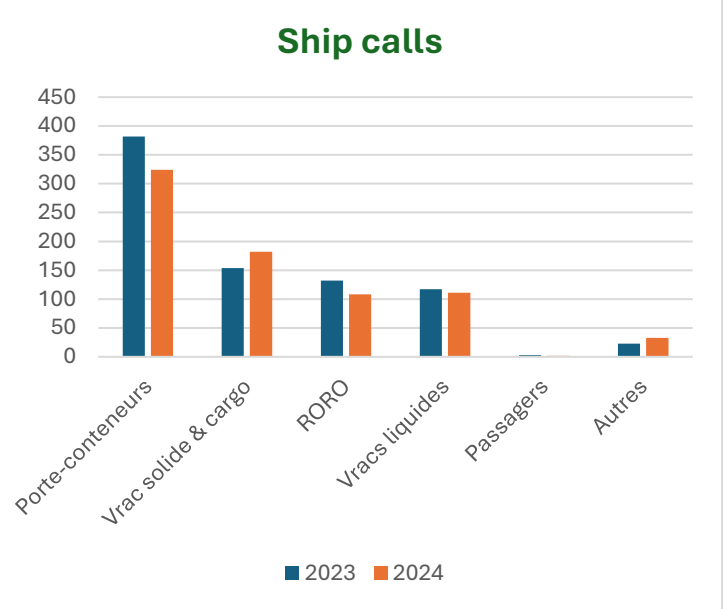


Figure 2. Overview of ship calls in 2023 and 2024 (source PAC, 2023 & 2024).

In 2023, the Port of Cotonou handled 9,567,877 tonnes of goods compared to 9,670,776 tonnes in 2024, while the number of vessel calls decreased from 811 in 2023 to 760 in 2024. Most of this traffic consisted of containerized cargo, with container vessels representing the dominant ship type, as shown in the following figures illustrating the ratio of different cargo types and vessel categories.

For several years, the Port of Cotonou has been engaged in a process of modernizing its infrastructure to increase its capacity to receive and process ships and goods. A total of twelve (12) projects are selected for implementation, and more information on these projects is available in the annex. These are the following, as described in table 1:

Table 1: Descriptive table of the modernization projects of the Port of Cotonou.

Project Name	Short description
Project 1: Construction of Terminal 5	The construction of a new 20-hectare bulk terminal and the improvement of nautical access will increase the production and competitiveness of the Port of Cotonou.
Project 2: Expansion of the port basin and renewal of the north quay walls	Extension of the port basin by 154 m to the west, renewal of 1400 m of existing quay to the north and dredging of the basin at the level of the north quay at -15 m. This project aims to accommodate large ships of + 300 m in length and a draught of more than 15 m from the world and to increase the container capacity of the Port of Cotonou.
Project 3: Centralized Access and Zongo Parking	The construction of a 13-hectare buffer car park and centralised access for all trucks will relieve congestion on the Boulevard de la Marina and the Port of Cotonou, improve and digitalise truck access to the Port of Cotonou.

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

Project 4: Logistics Zone	The construction of a 40-hectare Africa Logistics Zone on the port platform, with warehouses that meet international standards, will create a value-added zone for specific products in transit to the sub-region. It was designated as a special economic zone by Decree 2024-1065.
Project 5: Second oil berth at the quay	Construction of a new berth for hydrocarbon products as well as the increase of +/- 4 ha in the port for the development of reception capacity.
Project 6: Development of the nautical service area (ex-Fishing Port)	The development of a nautical service area for the naval forces, the lookout, the tugs and the shipyard will provide a common service area for naval activities.
Project 7: Grand Nokoué Logistics Platform	Construction of five (5) warehouses of 24000 m², including four (4) mixed dock and bulk warehouses and one (1) dedicated bulk warehouse. This project aims to relocate the warehouses currently located inside the port to the Abomey-Calavi area and to have new storage warehouses that meet international logistics standards.
Project 8: Construction of a new fishing port in Xwlacodji	Development of a new fishing port on an area +/- 8 ha in Wlacodji, dedicated to artisanal and semi-industrial fishing activities. This project aims to revitalize the Xwlacodji district and develop an area for the marketing and processing of fishery products.
Project 9: Construction of the Maritime Affairs Centre	Construction of the new building of the General Directorate of the Autonomous Port of Cotonou. This project aims to provide more space to improve the fluidity of port operations, bring together all the key stakeholders of the port platform and create a more efficient working environment.
Project 10: Rehousing of the resellers of Boulevard de la Marina	Social project for the construction of a building dedicated to sales and catering, including two halls with 250 seats, 36 shops, 24 sales kiosks, a secondary hall with 12 seats for small saleswomen and retail spaces. This project aims to improve the flow of road transport and sanitation.
Project 11: Zongo Hangar-Driver Reception	Construction of a reception building for the drivers of the Zongo car park including a storage area, a waiting area, a catering area, offices and toilets. This project aims to provide a reception area for truck drivers and guarantee the safety of the Zongo car park.
Project 12: Rehabilitation & renovation of the CIP fence	Renovation and construction work on the fence of the Port of Cotonou, which extends over 3 km long and more than 5 m high, from the Presidency to the current Artisanal Fishing Port of Cotonou (POPAC).

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

1.3 Zoning and port activities

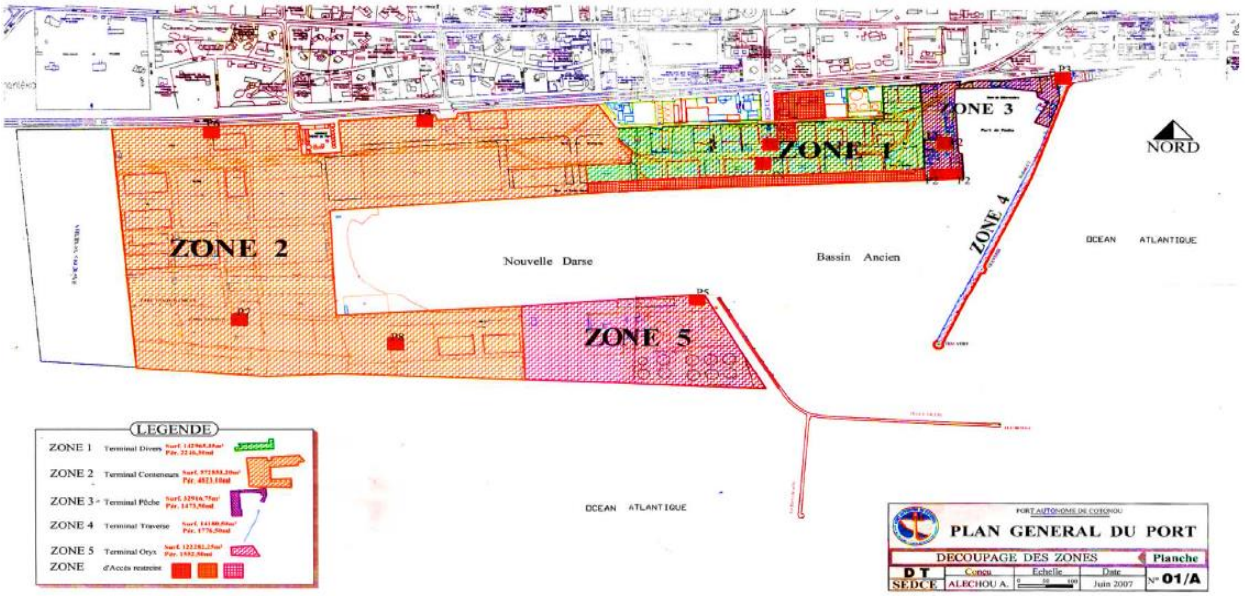


Figure 4. CIP Zoning

Current developments:

While logistics zone is being developed in zone 2, additionally, areas 3 and 4 are being redeveloped and transformed to accommodate more vessels, as part of an overall plan to transfer fishing activities to a new location to improve operational efficiency and port capacity.

Zone 1:

Zone 1 of the Port of Cotonou is dedicated to bulk goods and general cargo, mainly operated by SOBEMAP. Activities include the unloading and bagging of products such as cereals (rice, sorghum, millet) and chemicals (fertilizers, sulphur, clinker, gypsum, petroleum coke), as well as tropical products such as shea nuts and cashew nuts. The environmental management actions implemented include air quality and noise monitoring, environmental and safety inspections, waste management, cleaning of operating areas and awareness campaigns. The main challenges remain sulphur management, dust emissions from bulk unloading, compliance with safety regulations and the sanitation of warehouses.

Zone 2:

Zone 2 is reserved for container handling and includes the container terminals, a uraniumate storage warehouse and maintenance workshops for the handling companies' vehicles. The main operators present are SOBEMAP, Benin Terminal and CBCT. The area is relatively clean thanks to the containerized nature of the goods and the low presence of dockers on the ground. The PAC carries out regular inspections, air quality and noise monitoring campaigns, as well as waste management and awareness-raising actions. The

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

major challenges concern the management of waste oils, mechanical waste (especially batteries), used tyres and hazardous products in containers.

Zone 3:

Zone 3 is home to the PAC's floating equipment services, semi-industrial and industrial fishing companies, as well as the Artisanal Fishing Port of Cotonou (POPAC), managed by the Ministry of Agriculture, Livestock and Fisheries. There is also the base of the Navy, the towing station of the PAC and companies selling frozen products. Environmental actions include monitoring air quality and noise, maintaining spaces and buildings, waste management and raising awareness among port agents and fishermen. The main challenges are the management of waste oils, household solid waste and the adoption of good environmental practices by fishermen.

Zone 4:

Zone 4 covers the East Crossing, also known as Pier C, used for the handling of non-containerized frozen products and petroleum products, with overhead and underground pipelines. Solid bulk products such as wheat, clinker, gypsum and petroleum coke are also processed here. The PAC carries out environmental monitoring actions (air quality and noise), inspections, waste management, as well as awareness campaigns. The major challenges are dust emissions and spills during bulk unloading, compliance with safety instructions and the management of small oil leaks.

Zone 5:

Zone 5 is dedicated to the handling, storage and distribution of liquid and gaseous hydrocarbons (petrol, diesel, gas, jet, fuel oil). Operators present include ORYX Benin, PUMA Energy, JNP Octagone SA, as well as other oil depots under construction. The main challenges are disaster prevention and management, as well as the management of accidental spills. An emergency management co-activity plan has been developed and is being exercised on a regular basis. The PAC also continues environmental monitoring, inspections and user awareness activities.

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

1.4 Institutional framework

The General Management of the PAC is composed of:

- A Managing Director;
- 8 Technical Directors including 4 members of the Management Committee;
  - 15 Heads of Department and 39 Heads of Department, where units are smaller operational divisions within a department.

The structure of the PAC is shown in Figures 6 and 7 below. Environmental responsibilities are indicated in green.

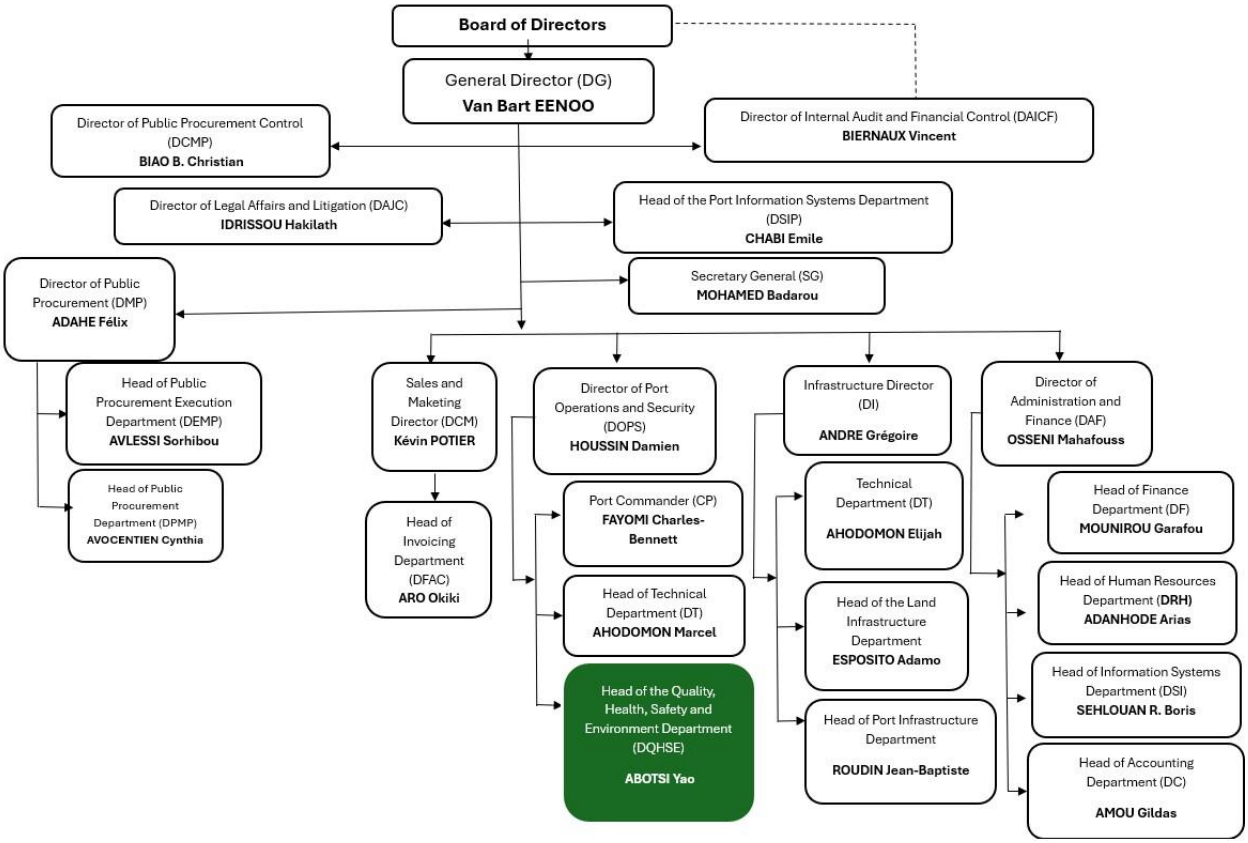


Figure 5. The structure of the PAC

Port Operations and Security Directorate (DOPS)

The mission of the Port Operations and Security Directorate is to coordinate port operations as well as activities within the framework of Occupational Health and Safety and the safety of people and property present on the port domain of Cotonou. In addition, it also coordinates activities to safeguard the port and marine environment.

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

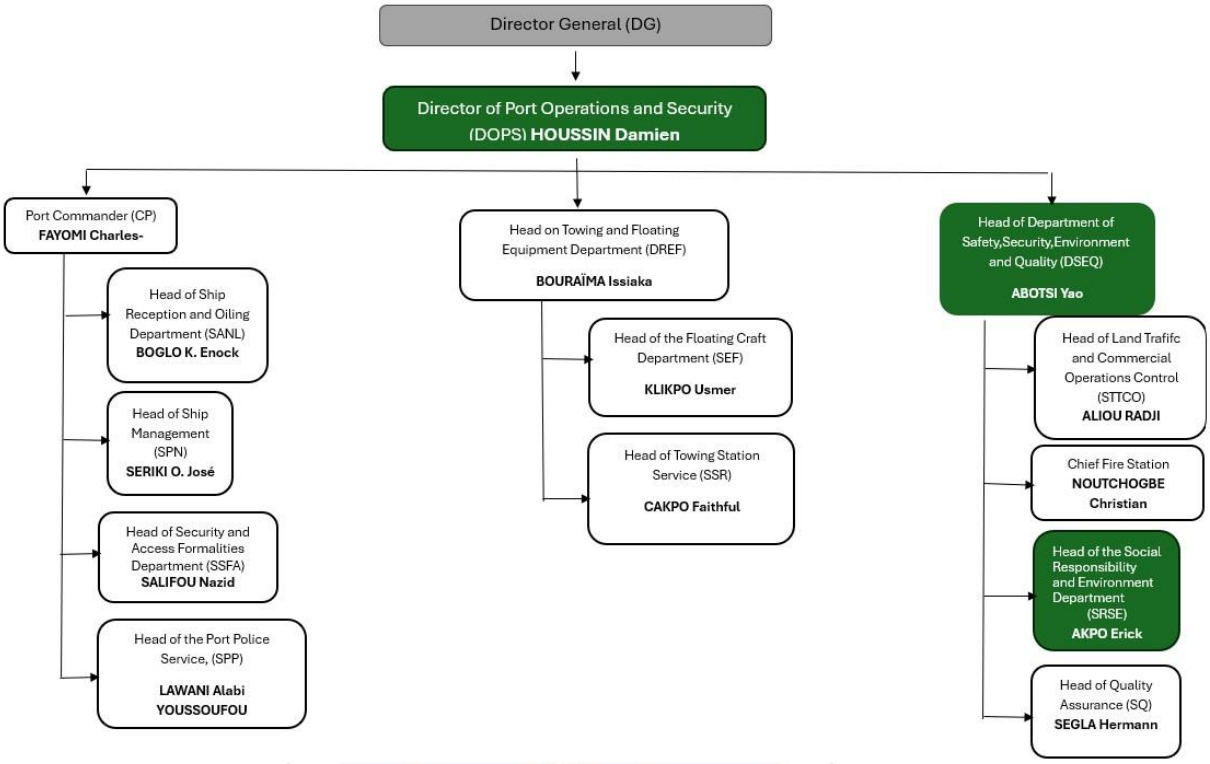


Figure 6. Structure of the PAC Harbour Master's Office - Departments of Land Operations, Safety, Environment and Quality

Department of Quality, Health, Safety and Environment (DQHSE)

The mission of this Department is to ensure the improvement and better monitoring of Quality, Health, and Safety of People and the Environment management processes and systems. It assesses risks, advises the General Management on Security, raises staff awareness of security and puts in place mechanisms that guarantee a less risky management of safety.

Social Responsibility and Environment Department (SRSE)

The SRSE is responsible for the following:

- Develop and monitor the implementation of the port authority's environmental policy;
- Design and implement the Environmental Management System (EMS) of the Port of Cotonou;
- Monitor the environmental impacts of work on the port platform and propose improvement measures; and
- Carry out environmental audits of the Port of Cotonou.

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

Sustainability Department (SD)

Created in August 2024, the SD is responsible for the following:

- identify and analyse the issues of social responsibility of the Autonomous Port of Cotonou with the port community and the municipalities of Benin;
- define a policy for the commitment of the PAC's social responsibility with reference to ISO 26000 in its latest version;
- develop a strategy for the implementation of the PAC's social responsibility policy;
- establish an annual plan with a budget for the implementation of the PAC's societal measures;
- Define performance indicators (KPIs) to assess the progress of the PAC, in terms of social responsibility.

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

1.5 Stakeholders needs and expectations

The PAC has identified its relevant stakeholders, through the combination of their influence/impact and their interest in the Port of Cotonou. Numbering thirty-one (31) in 2024, these relevant stakeholders are classified into two categories, namely those "**Internal**" and those "**External**". Figure 5 shows the distribution of relevant stakeholders in the PAC.

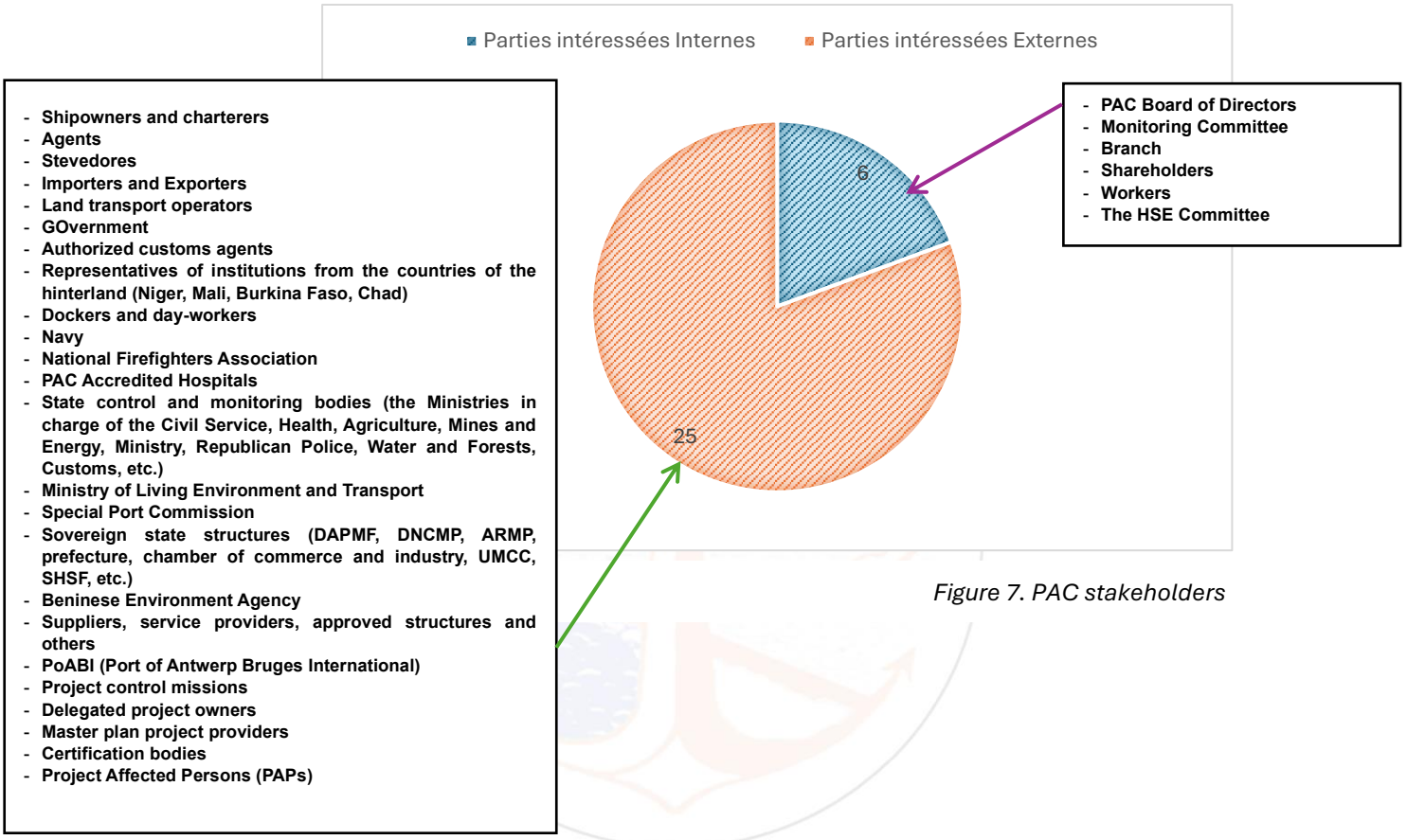


Figure 7. PAC stakeholders

The Port of Cotonou's stakeholders have clear and varied expectations regarding the management and operation of the port. They want the rigorous implementation of the resettlement and/or compensation action plan when necessary, as well as strict compliance with the contractual clauses. They also expect projects to fully comply with economic, social and environmental requirements. Facilitating administrative formalities is essential to ensure smooth operations, as is ensuring safety on site. Infrastructure and logistics must be adapted to accommodate ships efficiently, with simplified docking and port management procedures. It is also important that safety devices and equipment are available at all times, in accordance with the applicable environmental and social regulations and requirements. Stakeholders expect the timely payment of invoices, transparency in public procurement procedures and compliance with established guidelines. Finally, the overall performance of the port is also based on the proper management of the administrative formalities related to the declarations or authorisations necessary for the smooth running of the missions.

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

2 ENVIRONMENTAL COMPONENTS MONITORED

2.1 Air quality

Three sources of particulate matter emissions into the air have been identified at the port of Cotonou. These are:

- Handling and storage activities for solid bulk;
- Exhaust gases from trucks and other equipment (handling equipment, commercial vehicles, ships, etc.);
- Constructions as part of the modernization projects of the Port of Cotonou.

In 2022, the PAC, which did not have the devices to measure air pollution indicator parameters, had carried out spot measurements. Since November 2023, the PAC, thanks to the support of the Belgian Agency for International Cooperation Enabel, and in cooperation with the company Airscan, has installed sensors (Figure 8) and Owen gauges (Figure 9) in the port and its surroundings for permanent monitoring of air quality and precipitation analyses. Seventeen (17) Kunak Air Pro sensors have been installed. These stations measure the concentrations of ozone, nitrogen dioxide, sulphur dioxide and carbon monoxide continuously (real time). In addition, seven (7) Owen gauges have been installed. These gauges store precipitation on 28-day cycles in a protected reservoir. Then, the collected rainwater is analysed to determine the presence of soluble and insoluble metals as well as polycyclic aromatic hydrocarbons.

2.1.1 Ambient air

It is important to note that the air pollution indicator parameters measured at the port of Cotonou are as follows:

- Carbon monoxide (CO).
- Nitrogen dioxide (NO2)
- Sulphur dioxide (SO2)
- Ozone (O3)

Thus, the graphs below provide information on the evolution of these parameters in the Port of Cotonou and its surroundings for the period from November 2023 to November 2024. Finally, the results of 16 of the 17 sensors were used, since 1 sensor had to be moved to a new location. It should be noted that the data from the PTU Parking sensor was not taken into account due to damage that affected its operation. Similarly, the sensor located in the Sulphur Deposition Zone encountered connectivity issues, limiting the reliability of its measurements. In addition, at the Cotton Storage, a malfunction of the ozone measuring cartridge prevents any interpretation of the concentrations of this pollutant for this site.

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

It can be concluded, by comparing the threshold values established by Republic of Benin and those of the World Health Organization, that increased values are observed for ozone, nitrogen dioxide and particulate matter (PM). For ozone and PM10, some detectors also show that Benin's threshold values are exceeded. These values will be closely monitored and an action plan will be developed with actions to reduce these values.

Figure 8. Location of air quality monitoring sensors.

2.1.1.1 Carbon monoxide (CO)

CO is a permanently occurring pollutant in the atmosphere, typically reaching baseline concentrations of 100 ppb. This pollutant is strongly influenced by combustion processes and anthropogenic activities. Ships, especially those running on heavy fuel oil, produce carbon monoxide due to the incomplete combustion of these fuels. This emission is exacerbated when engines are idling at the dock or during berthing and departure manoeuvres. Transporting goods by truck, commercial vehicles and handling equipment (forklifts, cranes, etc.) running on diesel or petrol are a significant source of CO. Road congestion around the port, where vehicles (often obsolete) often remain stationary or in slow traffic, promote incomplete combustion and increased emissions. Thermal power plants, generators and waste combustion are other sources of CO.

The highest averages are found in urban areas, particularly at the entrance scan (951.21 µg/m³), followed by the Palais du congrès (631.27 µg/m³) and the Hôtel Azalai (546.88

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

µg/m³). These sites also record significant maximum values, sometimes exceeding 2000 µg/m³. Conversely, the Digue has the lowest average (345.25 µg/m³). The highest concentrations are generally found in areas of heavy traffic and industrial activities, suggesting marked urban pollution. As with other pollutants, a clear seasonality is observed, with higher concentrations in winter (December, January, February), due to a lower dispersion of pollutants and an increase in emissions, while spring and summer have lower levels, despite some occasional peaks throughout the year.

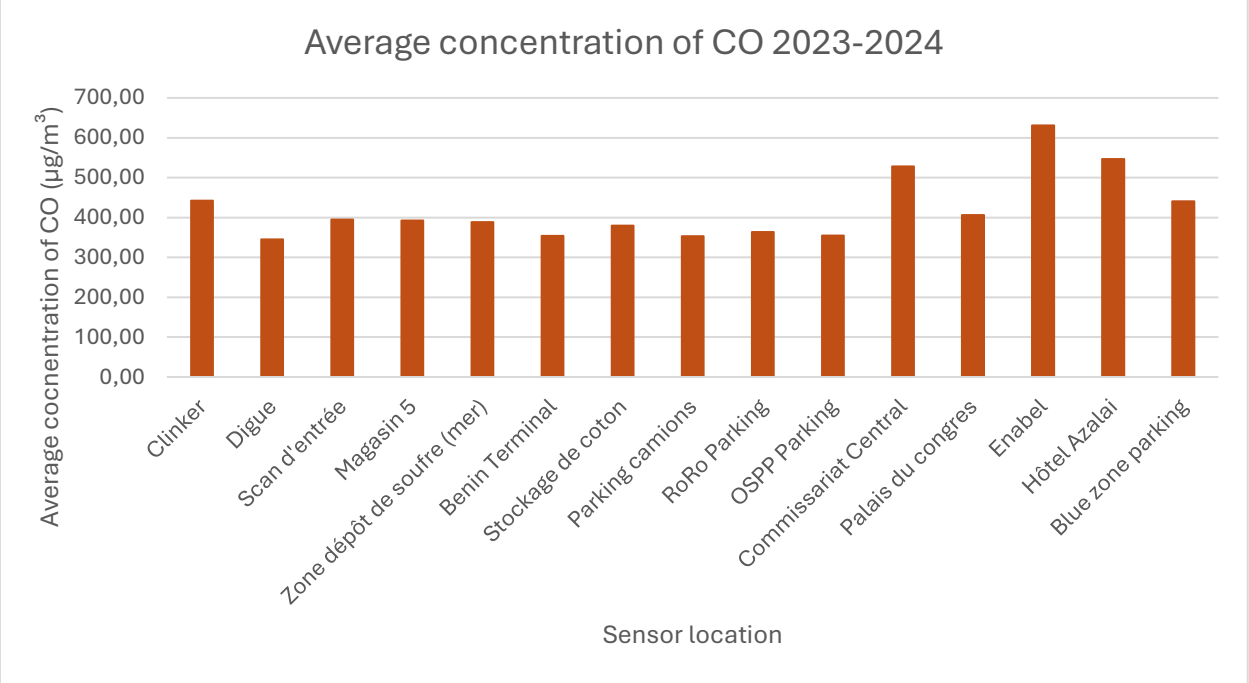


Figure 9. Average concentration of carbon monoxide in air.

2.1.1.2Nitrogen dioxide (NO_2)

Nitrogen dioxide is a major air pollutant, mainly from combustion (vehicles, handling equipment, etc.). Vessels running on heavy fuel oil release significant amounts of NO_x, especially during the docking, undocking and docking phases when the auxiliary engines remain running. The high density of trucks, handling equipment and diesel vehicles operating around the port contributes to significant NO_x emissions. The accumulation of these emissions in a confined area amplifies local pollution. Other internal combustion engines, such as those in generators, can also be a source of NO_2.

In addition, Cotonou's warm, sunny climate favours the transformation of NO into NO_2 and contributes to the formation of ground-level ozone. In the absence of strong winds, NO_x can stagnate and accentuate local pollution.

The analysis of NO_2 concentrations at the port of Cotonou over one year reveals significant disparities between the measurement sites. The highest average levels are observed at the Azalaï Hotel (17.92 µg/m³), at the sulphur deposition site (13.18 µg/m³) and at the cotton

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

storage (11.45 µg/m³), while the lowest are at Clinker (3.44 µg/m³) and La Digue (6.11 µg/m³).

The annual analysis of nitrogen dioxide (NO_2) reveals marked differences between port and urban areas, influenced by human activities and weather conditions. At the port, sites such as the entrance scan, the cotton storage or the RoRo Terminal have frequent peaks, linked to truck movements and diesel emissions. In the city, sustained concentrations are observed at the Azalaï Hotel, Enabel or the Palais des Congrès, reflecting the impact of urban traffic and possibly the port. A notable increase in NO_2 levels is recorded at the end of the year, starting in October, coinciding with the dry season, a period when the dispersion of pollutants is reduced and logistics activities intensified.

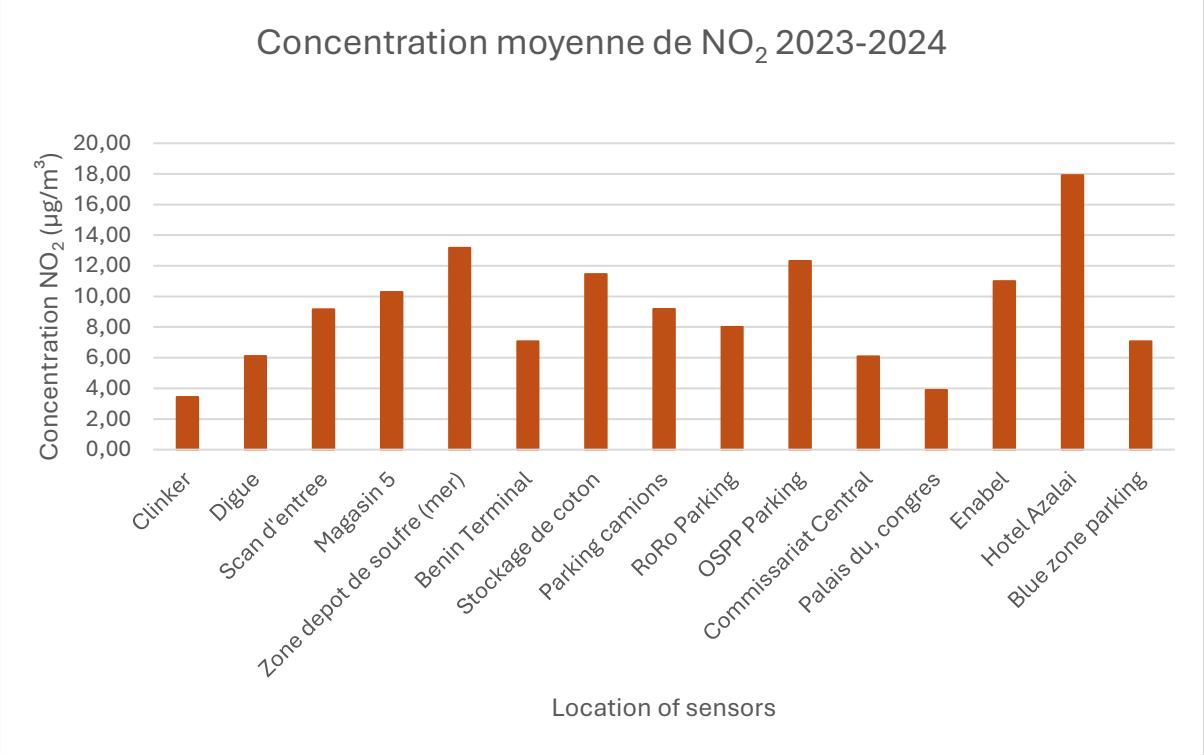


Figure 10. Average concentration of nitrogen dioxide in the air.

2.1.1.3 Sulphur dioxide (SO_2)

Sulphur dioxide (SO_2) is a gas that is widely involved in air pollution. Like CO and NO_2, it is a pollutant typically emitted by the combustion of fossil fuels containing sulphur, including heavy fuel oil used by ships and diesel fuel used by diesel vehicles (e.g. the many trucks in the port). But other internal combustion engines can also be the source.

The highest average levels are recorded at the offshore sulphur deposition (14.13 µg/m³), the inlet scan (13.53 µg/m³) and the 5 magazine (10.28 µg/m³), indicating a strong influence

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

of port and industrial activities on sulphur pollution. At Enabel, although the average (30.4 µg/m³) is the highest, it is assumed that this value results from interference with other chemical components during the work, leading to abnormally high peaks. The maximum values are particularly high in some areas, reaching 940.51 µg/m³ at the sulphur deposition at sea and 557.65 µg/m³ at Enabel, which confirms the presence of occasional extreme pollution events.

The analysis of sulphur dioxide (SO_2) concentrations reveals marked pollution in port areas, with the highest average levels at the offshore sulphur deposition, the Entrance Scan and Warehouse 5, highlighting the impact of industrial and maritime activities. Although Enabel records very high averages, these values seem to be biased by chemical interference. Extreme SO_2 peaks, especially in October, January and during some port operations (loading, unloading), indicate intermittent but intense pollution. In cities, concentrations are lower but occasional increases can occur, particularly around Enabel and the Blue Zone Parking, often in connection with port emissions or sources such as generators.

The high levels of particulate matter measured between November and February can be attributed to dry season conditions, which reduce the natural cleansing of the atmosphere by rain, increase the presence of dust in the air, and limit the dispersion of particulate matter

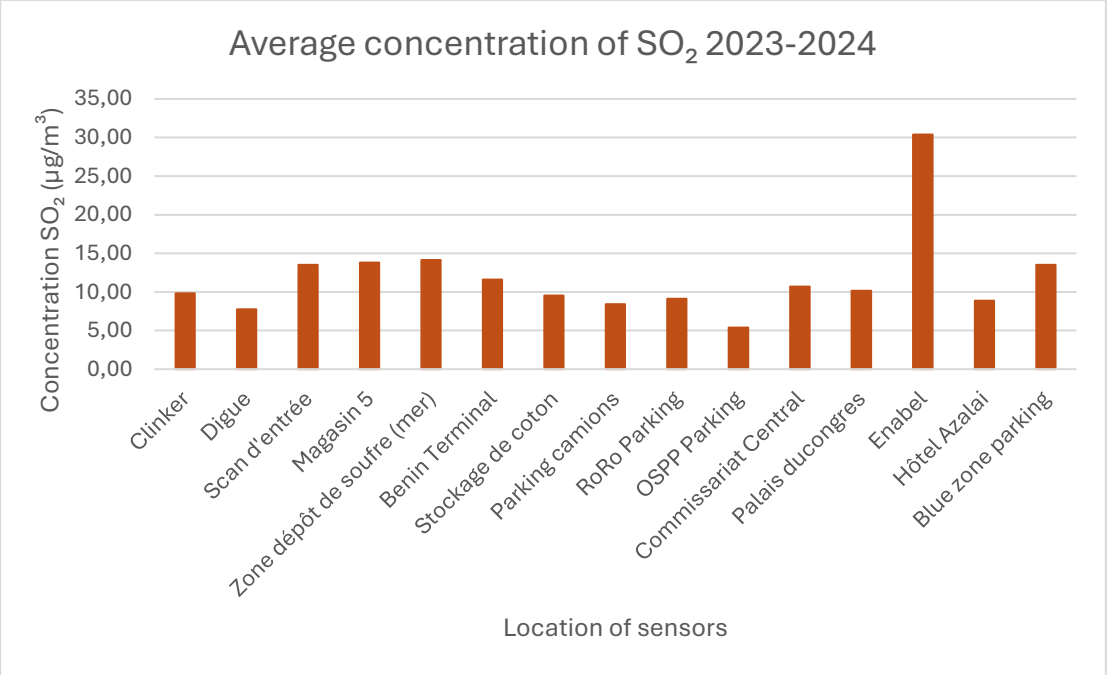


Figure 11. Average concentration of sulphur dioxide in the air.

due to temperature inversions and calmer winds — especially since no unusual or different activities were recorded during this period. Unlike NO_2, SO_2 pollution is more irregular, with sudden and intense peaks, probably caused by the discharge of sulphur or the use of heavy fuel oil. To clarify, sulphur deposition is not a source of sulphur dioxide in the air. These are created by combustion processes, while the sulphur deposit contains sulphur in powder form (S_8). This remains a risk to safety, health and the environment. This substance is easily

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

transported by wind, highly corrosive, can cause respiratory problems and seeps into the basement, potentially damaging the environment.

2.1.1.4 Ozone (O_3)

Ozone (O_3) is an unstable gas that plays an essential role in the atmosphere but can also be a dangerous pollutant. Ozone concentration is related to two factors:

❖ The intensity of the sun (natural)

❖ Presence of precursors, mainly anthropogenic, and especially NO_2. Cotonou's warm, sunny climate favours the transformation of NO into NO_2 and contributes to the formation of ground-level ozone (O_3). In the absence of strong winds, NO_x can stagnate and accentuate local pollution.

❖ Volatile organic compounds from fuel storage and combustion

The highest average concentrations are observed in the city, including Enabel (25.67 ppb), Palais du Congrès (25.86 ppb) and Hotel Azalai (24.68 ppb), with maximum values exceeding 60 ppb over several days. However, when analysing the exceedances of the critical thresholds (>60 ppb over 8 hours), we can see that Benin Terminal (18 days), Digue (15 days) and Clinker (7 days) are the most affected sites. These port areas, located on the coast, are therefore more frequently subject to prolonged episodes of ozone pollution.

The analysis of ozone concentrations highlights a marked distinction between urban and port areas: the highest averages are observed in cities, while peaks and exceedances of critical thresholds are more frequent on the coast, especially in port. This dynamic results from the interaction between local emissions (traffic, industry, ships and precursors such as nitrogen oxides (NO_x) and volatile organic compounds (VOCs), weather conditions (sunshine, sea/land breezes, humidity) and photochemical processes.

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

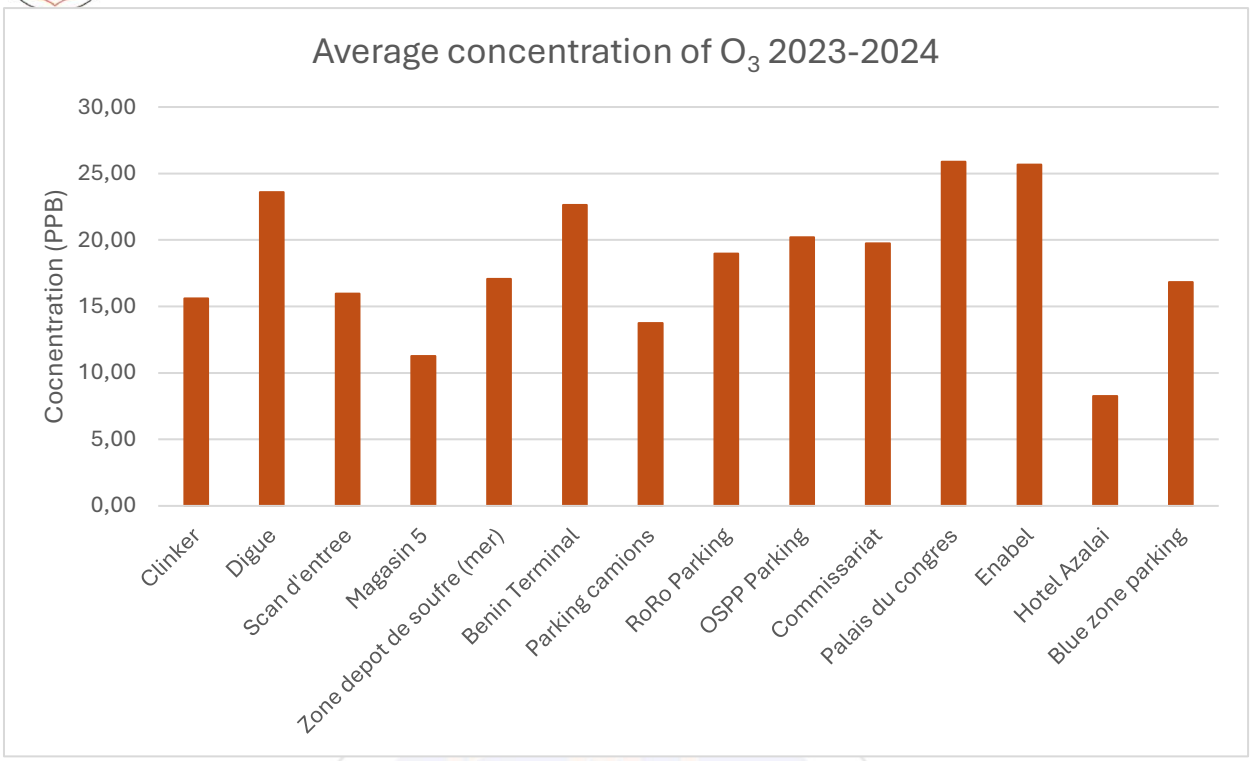


Figure 12. Average concentration of ozone in the air.

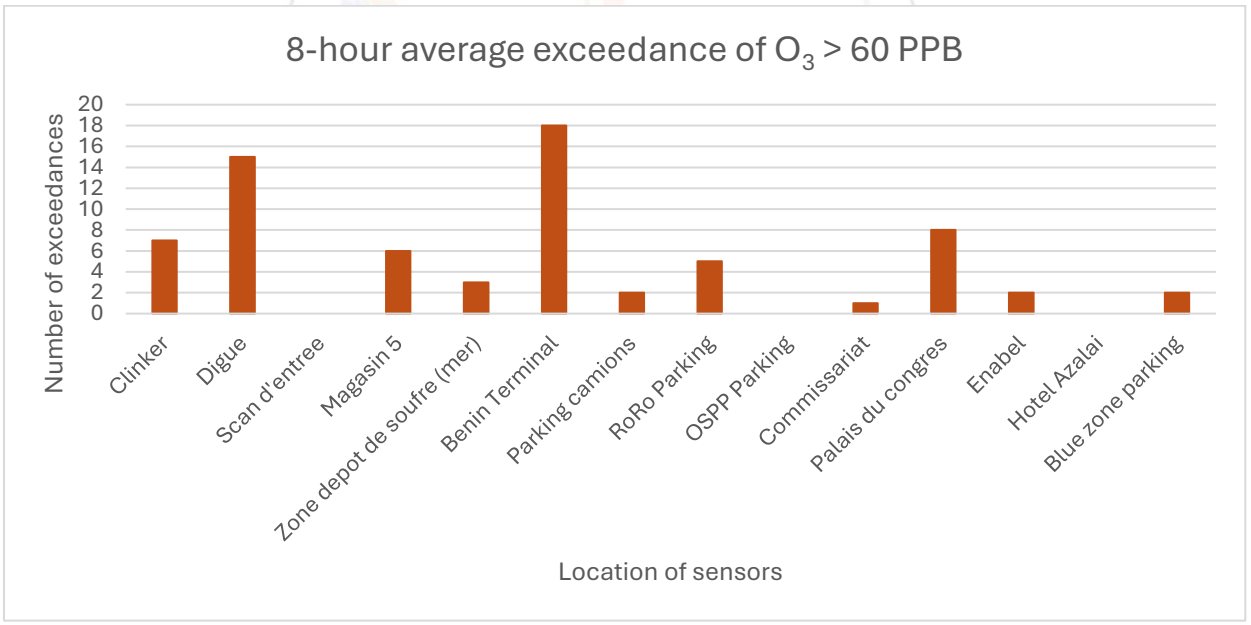


Figure 13. 8-hour average exceedance O_3 (> 60 PPB)

2.1.1.5 Particulate matter (PM)

Particulate matter stands for solid particles of various sizes depending on their origin that remain suspended in the air. Particulate matter in the outdoor environment comes from various sources such as transportation, industry, construction sites, fires, and agriculture.

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

It is a set of solid or liquid particles present in the air in the form of aerosols. They can vary greatly in size, chemical composition and origin.

Ships emit large quantities of PM_{10} and $PM_{2.5}$ via the combustion of heavy fuel oil (often with a high sulphur content), particularly during manoeuvres, docking and loading/unloading goods. The constant flow of trucks, material handling equipment and commercial vehicles leads to a high emission of particulate matter, mainly from diesel engines. Tire and brake wear also contribute to particulate pollution.

The proximity of Cotonou, a dense city subject to heavy traffic, amplifies the presence of fine particles from domestic combustion (wood, coal), waste incineration and construction sites. In addition, wind erosion and Saharan dust can aggravate the concentration of particles in the air.

Due to its coastal location, the port is also influenced by marine aerosols rich in sodium salts and suspended particles from maritime activities.

Measurements carried out in the port area between 2023 and 2024 for $PM_{2.5}$ show values consistently above the threshold of 5.0 µg/m³ set by the WHO. The highest values were observed in clinker (33.89 µg/m³). The proximity of the cement plant (the cement powder itself is very fine and dry, and incinerators are possible sources) as well as the construction site of Terminal 5 are possible explanations. Other areas with high values, such as the Benin terminal, the RoRo car park and the Coton warehouse, are said to be due to the presence of heavy traffic.

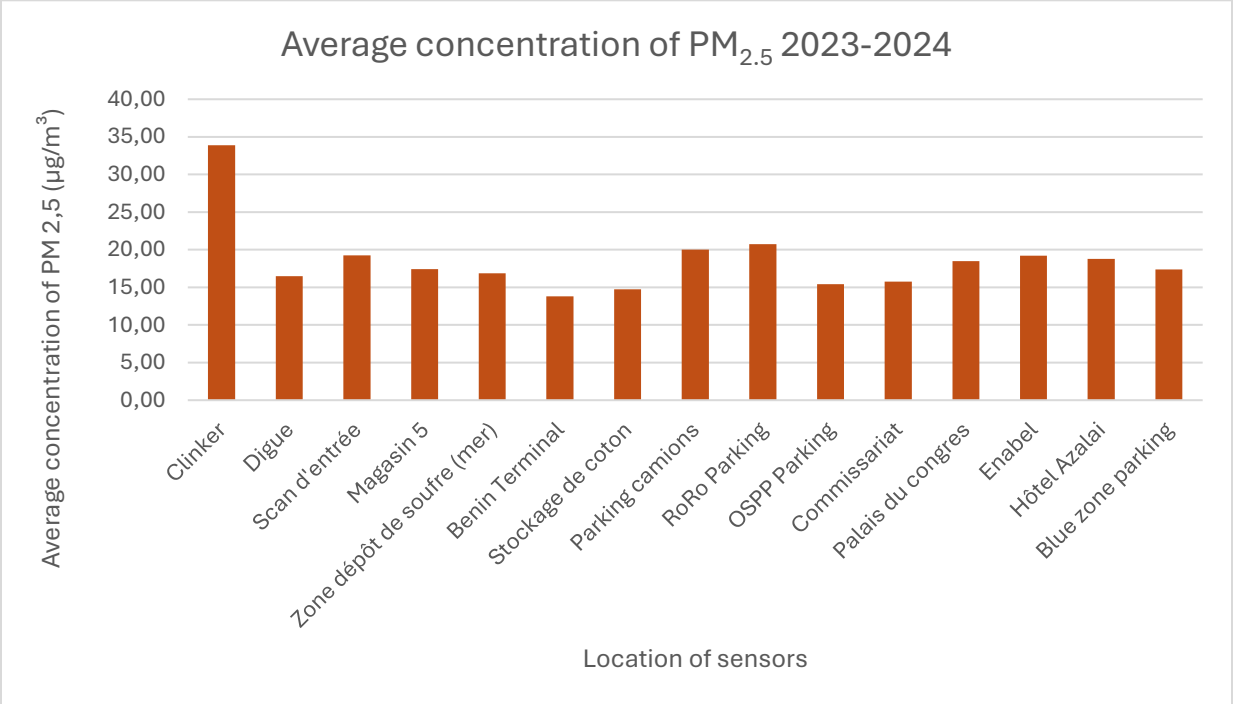


Figure 14. Average PM concentration $_{2.5}$ for 2023-2024 per sensor

The results of the PM_{10} measurements show high concentrations at all sensors, with the number of days exceeding the 50 µg/m³ threshold set by the WHO being well above the recommendation of three to four days per year. The highest values were observed in the Sulphur Deposition Zone (sea) (mean 66.13 µg/m³) and Clinker (mean 79.38 µg/m³), with

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

peaks of 1,079.2 µg/m³ and 996.71 µg/m³, respectively. These extreme levels are mainly related to industrial activities, including the storage and transportation of sulfur and cement. Other areas showing an increased presence of PM_{10} are truck-intensive areas such as Entrance Scan, Truck Parking and RoRo Parking, highlighting the impact of heavy traffic emissions on air quality. The city's sensors also show worrying concentrations. Sensors close to the port, such as those located near the (former) Enabel offices, the Palais du Congrès or the Azalaï Hotel, have relatively high concentrations, which testifies to the impact of the port. For the offices of Enabel and Klinker, proximity to a construction site was also an important factor.

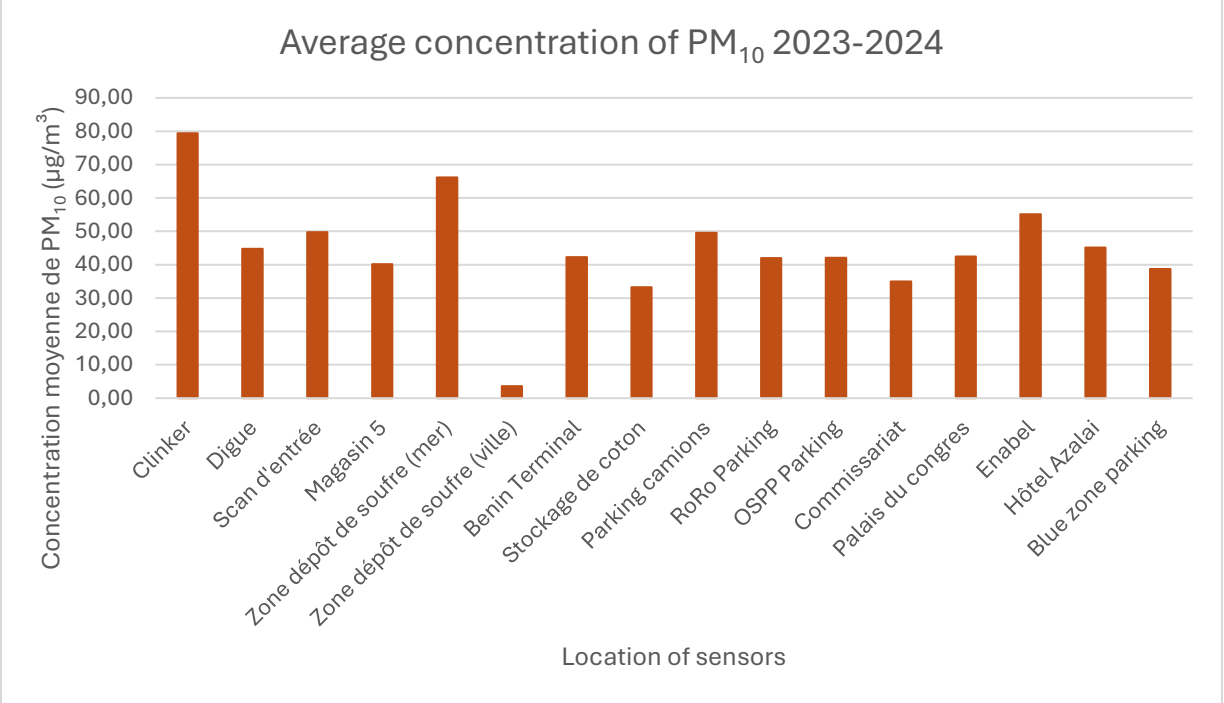


Figure 15. Average PM_{10} concentration for 2023-2024 per sensor

Over time, we see a relative increase in particulate matter concentration during the dry season(s), when rainfall is low, and during increased activity in the port, such as when loading and unloading cement or fertilizer.

2.1.2 Atmospheric deposition (precipitation)

Precipitation samples from the Owen gauges were analysed for the following heavy metals and polycyclic aromatic hydrocarbons (PAHs).

- Heavy metals: Antimony, Arsenic, Cadmium, Chromium, Cobalt, Tin, Iron, Manganese, Nickel, Lead
- PAHs: Benzopyrene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo[a]anthracene, Chrysene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, Indeno[1,2,3-cd] Pyrene, Dibenzo[a,h]anthracene, Benzo[ghi]perylene, Naphthalene, Acenaphthene, Acenaphthylene

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

Figure 16. Location of Owen gauges

2.1.2.1 Heavy metals

The analysis of heavy metal concentrations in rainwater reveals marked trends according to gauges and collection periods. Some gauges appear to be systematically more impacted, while some collections show pollution peaks for several metals simultaneously (tables 2 and 3).

The study highlights significant pollution of rainwater by heavy metals, with sources of contamination mainly linked to port activities, truck traffic and industrial emissions. It also highlights significant pollution of rainwater by heavy metals, with sources of contamination mainly linked to port activities, truck traffic and industrial emissions. In our view, it remains difficult, given the variation between soluble and insoluble metals and also given the variation over time, to draw a conclusive conclusion about the cause or a specific area around this key point.

Table 2: Averages of insoluble heavy metals

Mean insoluble heavy metals (µg/L)							
	Gauge 1	Gauge 2	Gauge 3	Gauge 4	Gauge 5	Gauge 6	Gauge 7
Sb	0,238	0,543	0,291	0,684	0,363	0,552	0,314
As	1,239	0,435	1,063	0,788	0,324	0,361	0,556
Cd	0,134		0,130	0,105	0,075		
Cr	12,218	1,375	5,518	7,903	2,667	1,886	3,183
Co	1,461	0,351	1,103	0,867	0,470	0,292	0,594
Sn	0,793	2,328	0,470	1,056	3,252	0,530	0,438
Fe	5458,351	756,593	2087,255	3095,541	1038,196	640,417	1387,120
Mn	68,898	21,218	50,497	43,442	16,948	12,757	25,953
Ni	4,982	2,496	2,357	3,536	1,769	1,536	2,423
Pb	4,515	3,215	19,772	8,872	2,607	2,589	3,550

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

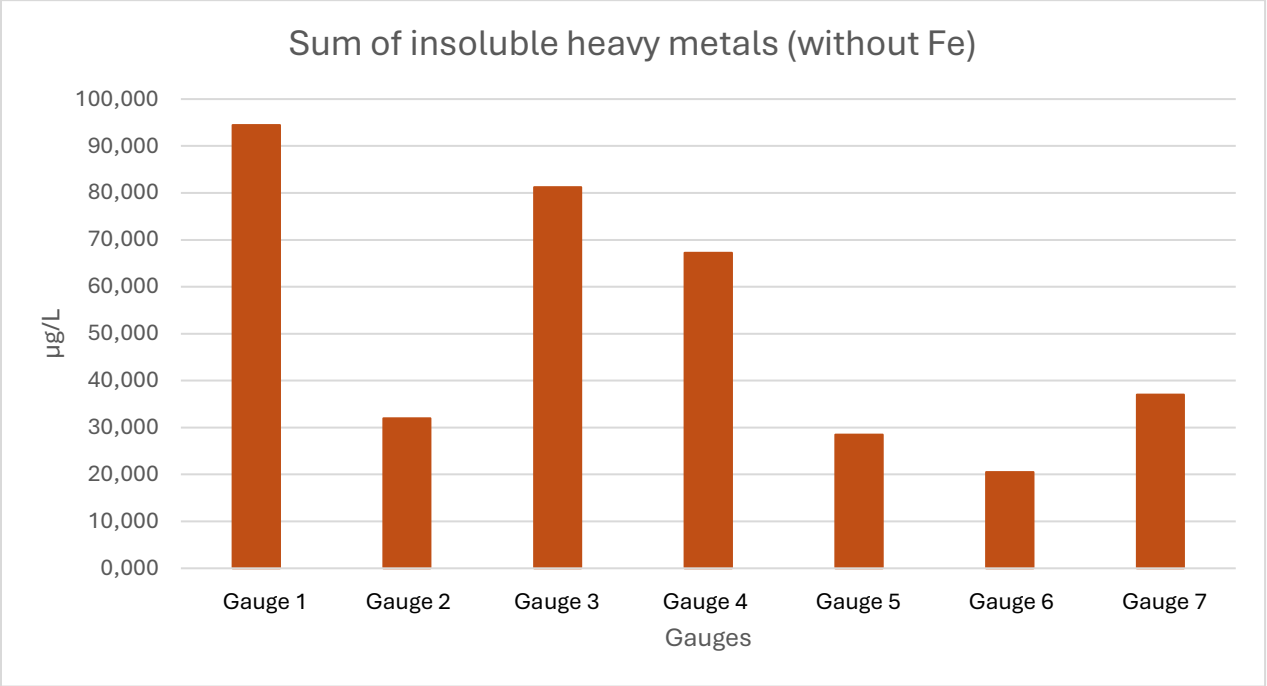


Figure 17. Insoluble heavy metals sum (without Fe)

Table 3: Soluble heavy metal averages

Mean soluble heavy metals (µg/L)							
Gauge	Gauge 1	Gauge 2	Gauge 3	Gauge 4	Gauge 5	Gauge 6	Gauge 7
Sb		1,010	0,560			0,983	
As	0,305	1,461	0,433	0,215	0,275	1,287	0,527
Cd							
Cr	1,013	1,797	0,635	0,630	0,665	0,600	1,040
Co					0,420		
Sn			1,400			7,890	
Fe	17,575		15,850		80,700	43,400	22,200
Mn	0,367	4,905	0,510	1,985	6,974	0,370	2,368
Ni							
Pb		0,520	0,790		1,000		

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

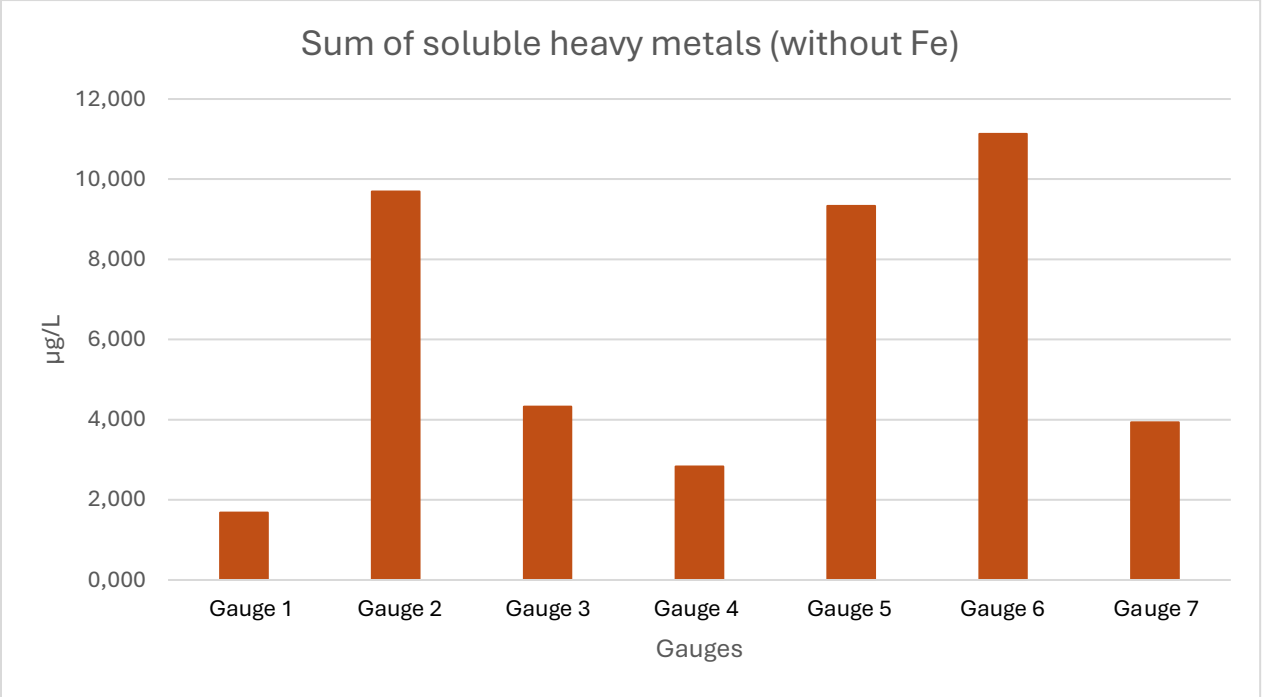


Figure 18. Sum of soluble heavy metals

2.1.2.2 Polycyclic aromatic hydrocarbons (PAHs)

Analysis of polycyclic aromatic hydrocarbons (PAHs) detected in rain gauges reveals variability in concentrations depending on the compounds and measurement sites (table 4). Of the PAHs sought, only a few are quantified, while several remain below detection limits.

Naphthalene is the most common compound. Its widespread presence in all gauges can be attributed to its volatile nature. The other PAHs detected were benzopyrene, chrysene and benzo(b)fluoranthene. There is no specific threshold value for PAHs, but their detection nevertheless indicates some form of contamination. Possible sources include biomass and fossil fuel combustion, industrial emissions, and road transportation.

Table 4: Averages of PAHs

Mean PAHs (µg/L)							
	Gauge 1	Gauge 2	Gauge 3	Gauge 4	Gauge 5	Gauge 6	Gauge 7
Benzopyrene				0,009		0,008	
Fluorene							
Phenanthrene							
Anthracene							
Fluoranthene						0,010	
Pyrene				0,008		0,011	
Benzo-(a)-anthracenee							
Chrysene				0,008		0,007	
Benzo(b)fluoranthene				0,007		0,009	
Benzo(k)fluoranthene							

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

Indeno (123-cd) Pyrene							
Dibenzo(a,h)anthracene							
Benzo(ghi)Perylene				0,008			
Naphthalene	0,775	1,432	0,658	0,058	1,230	0,911	0,768
Acenaphthene							
Acenaphthylene							

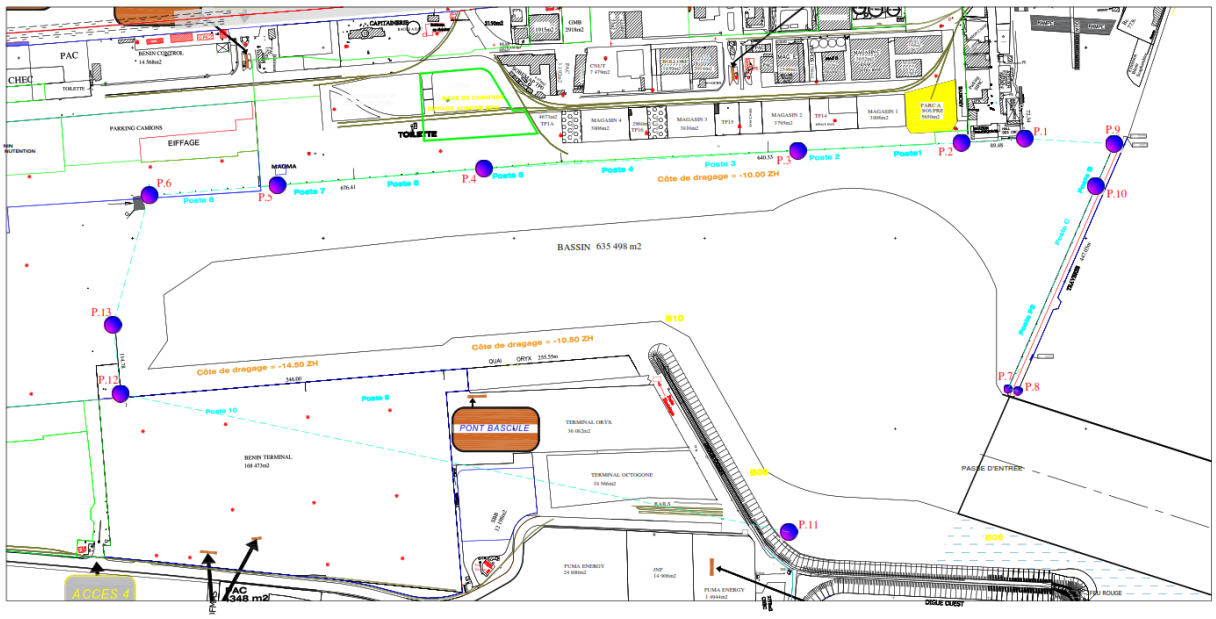
2.2 Water quality

Four sources of pollution of the waters of the port basin have been identified. These are:

- goods processing (handling and storage of dry bulk);
- stormwater from the city,
- accidents (accidental spills) and
- modernisation works in the Port.

With regard to water quality, two parameters were considered, which are turbidity and salinity. It is important to specify that the measurements are carried out at the level of thirteen (13) points (figure 18). Thus, the graphs below present the average values of the salinity and turbidity of the water in the Cotonou Port Basin from April to September 2024 (figures 19 and 20). Data for *North Dock Bollard N49* is not available for the reporting period due to ongoing work at the site.

Figure 19. CARTOGRAPHIE DES POINTS DE RELEVER DE LA TURBIDITE AU PORT DE COTONOU



Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

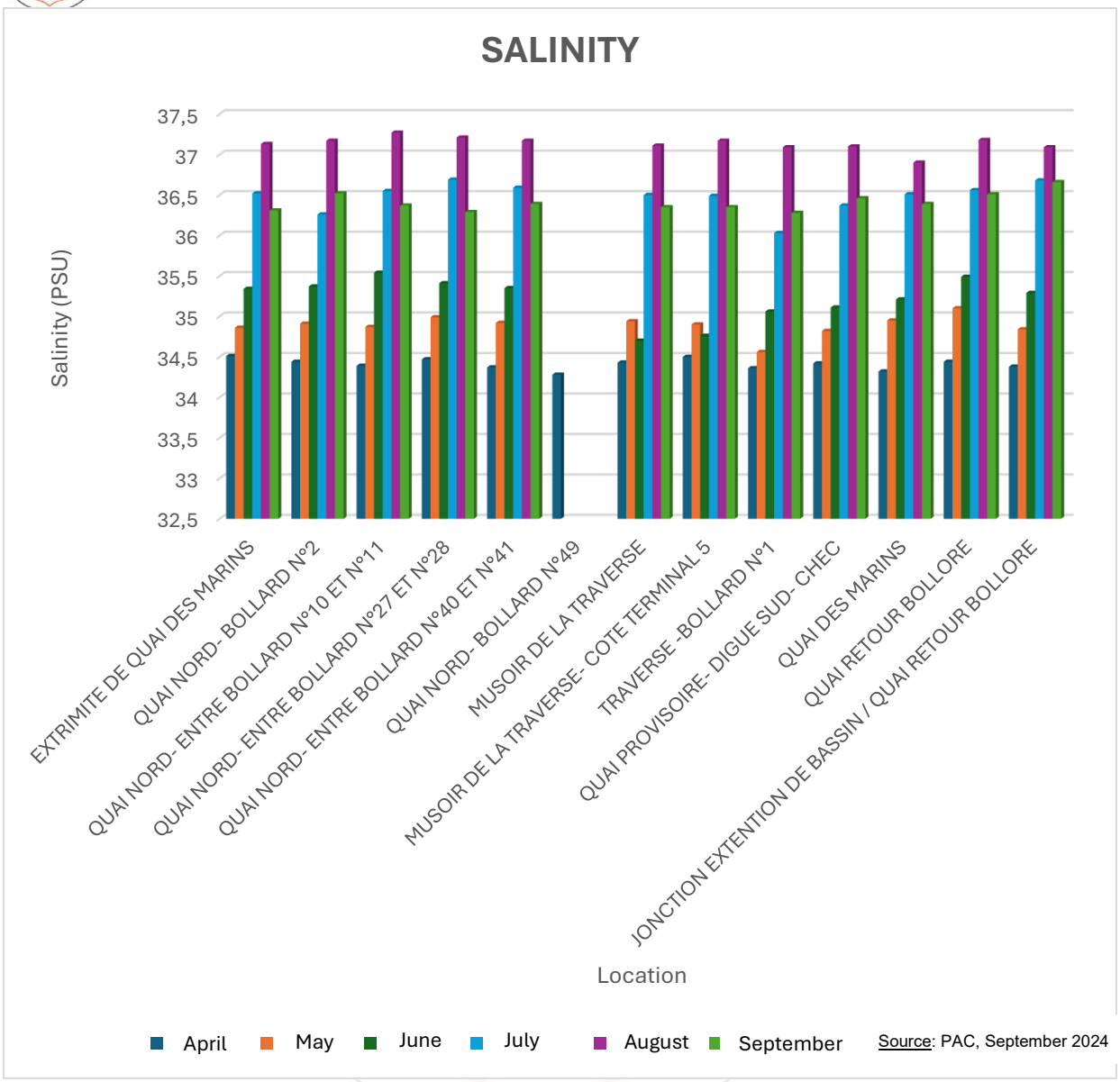
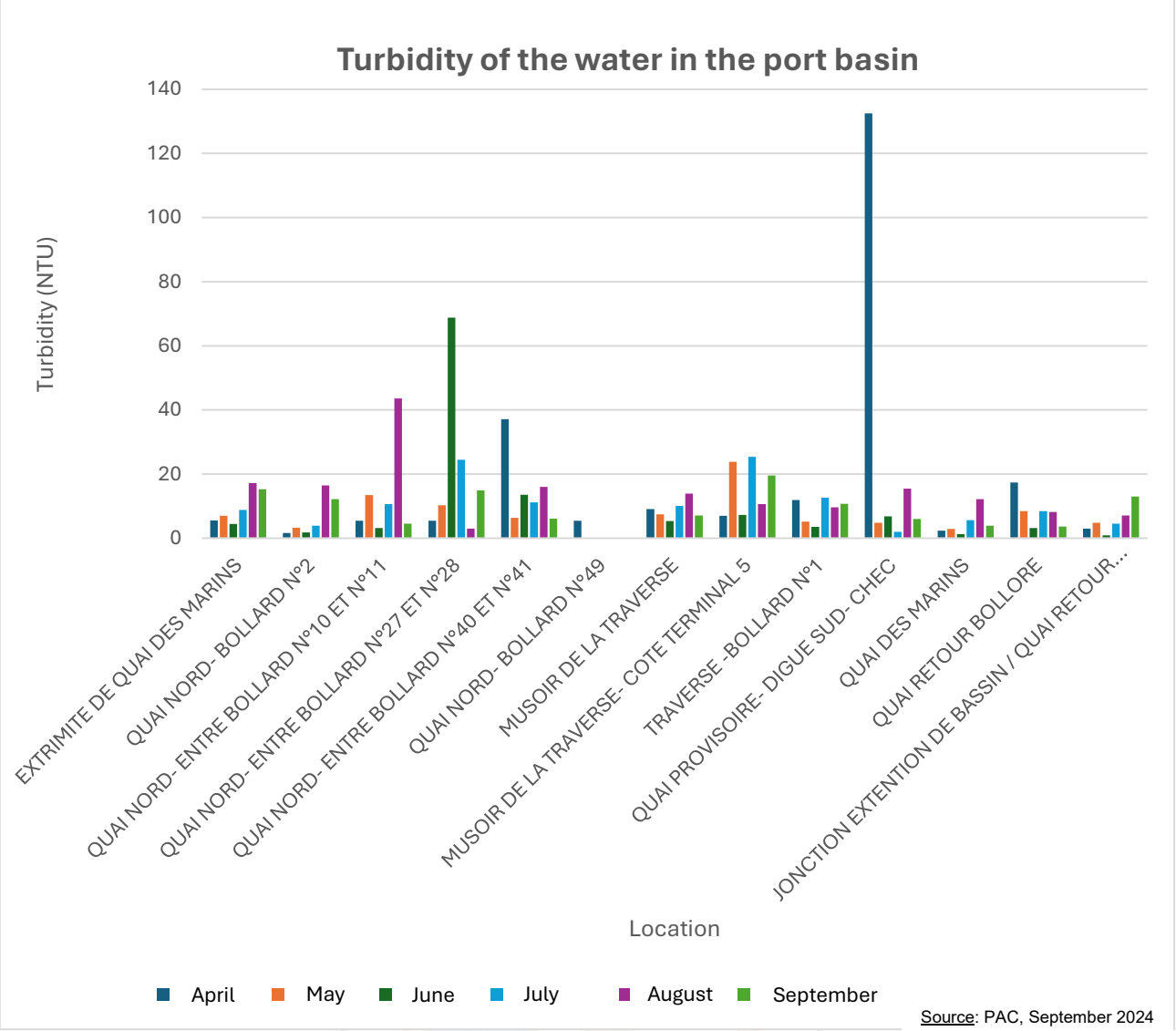


Figure 20. Salinity of the water of the Cotonou port basin.

Changes in salinity have a direct impact on aquatic ecosystems, biodiversity and human activities such as fishing. The salinity trend observed at the Port of Cotonou during the year shows no unusual variations, a slight variation in salinity was observed, which is considered normal and probably influenced by seasonal variations in freshwater supplies and tides. The average salinity values recorded in the Cotonou port basin between April and September 2024 vary between 34.2 and 37.2 PSU (Practical Salinity Unit) and are consistent with those of Benin's marine waters.

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj



Source: PAC, September 2024

Figure 21. Turbidity of the water in the harbour basin

Turbidity levels at the Port of Cotonou are generally between 10 and 30 NTU, with seasonal variations and depending on port activity. Values well outside this range indicate unusual sediment disturbance. The highest average values of water turbidity in the Cotonou port basin were recorded between April and September 2024 at the north quay level between bollards n°10 and n°11 as well as between those n°27 and n°28, and n°40 and n°41 (dry bulk handling area), and at the temporary quay-south breakwater, where the modernisation work of the Port of Cotonou is currently taking place. Turbidity levels in the solid bulk handling area can be elevated due to sediment resuspension and particle runoff related to loading, unloading and surface cleaning operations. The observed and measured increase in turbidity at CHEC location is attributed to ongoing construction and maintenance work in the area.

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

2.3 Noise

In the Port of Cotonou, noise pollution comes mainly from:

- loading/unloading of goods;
- the movements/movements of large vehicles and other vehicles;
- activities within the scope of modernisation work (such as threshing, demolition, excavation, etc.).

A noise measurement carried out in December 2024 provides the noise levels summarized in Table 5 below. On the Figure 22 The locations of the sound measurements can be found.

The mean values collected ranged from 56.3 dB to 75.4 dB. The highest average level, 75.4 dB, was recorded in the vicinity of the SIPIC Building during the collection period from 1 p.m. to 3 p.m.

The average noise levels (LAeq) recorded during the measurement campaign were above the limit values authorized by Decree No. 2022-301 of May 25, 2022 regulating noise in the Republic of Benin in almost all monitoring areas. However, at some locations in the port, wearing hearing protection is mandatory due to the high noise level.

However, the port area being considered an industrial zone and in accordance with the provisions of Article 14 of Decree No. 2022-301 of 25 May 2022 on the regulation of noise in the Republic of Benin, which provides that: "Notwithstanding the provisions of paragraph 1 of this article, the level of noise emission related to industrial production activities does not exceed 80 dB outdoors. It can therefore be concluded that the noise level at the Port of Cotonou is below the threshold, so wearing hearing equipment is not necessary on the open spaces of the port platform.

Table 5: Noise level in the port.

Surveillance zone	Geographic coordinates	Average Level (LAeq) of Noise			
		07:00 to 13:00	1:00 p.m. to 3:00 p.m.	3:00 p.m. to 10:00 p.m.	10:00 p.m. to 7:00 a.m.
BENIN CONTROL	6°20' 58.69" N 2°25' 8,289" E	**74,8**	**71,6**	-	-
ENTRY 5	6°20' 59.12" N 2°24' 49.64" E	66,6	**63**	-	-
RORO TERMINAL	6°20' 55.72" N 2°24' 43.22" E	-	-	-	**68,5**
PTU	6°20' 44.12" N 2°24' 46.29" E	58,2	**56,3**	-	-
PARKING 250 TRUCKS	6°20' 45.73" N 2°24' 43.30" E	**73,1**	**74,9**	-	-
PARKING HYDROCARBONS	6°20' 33.17" N 2°25' 27.71" E	67,1	**70,5**	-	-
DIKE (DIGUE)	6°20' 33.76" N 2°25' 43.23" E	68,5	**60,5**	-	-
CROSSING	6°20' 44.81" N 2°25' 56.00" E	-	-	-	**68,9**

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

SULPHUR PARK	6°20' 55.39" N 2°25' 50.50" E	**70,9**	**70,5**	-	-
SIPIC BUILDING	6°20' 57.23" N 2°25' 52.74" E	**74,78**	**75,4**	-	-
CONSTRUCTION SITE T5 (CCIB)	6°21' 2.754" N 2°26' 5,756" E	70	**75,4**	-	-
AZALAI	6°21' 6.420" N 2°26' 8,360" E	62,97	**60,90**	-	-
AMAZON	6°20' 49.21" N 2°24' 29.37" E	65,5	**62,1**	-	-
DECREE NO. 2022-301 OF 25 MAY 2022 on noise regulations in the Republic of BENIN		**70**	**50**	**70**	**50**

Source: ENVIPURE, December 2024

Figure 22. Location of sound measurements

2.4 Soil quality

Regarding the quality of the soil, it is important to specify that the port platform is relatively clean because sweeping, weeding, silting and stripping the deposits of the products handled, and the evacuation of garbage in the bins are normally carried out by service providers recruited for this purpose.

In addition, soil pollution on the port platform comes mainly from the handling and transport of bulk goods. Nevertheless, soil samples should be taken and analysed in order to have statistics to quantitatively define the level of soil pollution at the Cotonou port platform.

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

There is currently a sulphur stockpile in the sulphur park in the port area. Due to the closure of the Niger border, it has been in place for more than a year. A soil study is recommended in the short term, as well as a study on a possible leaching of sulphur substances in the port basin.

2.5 Waste management

- **Waste similar to household waste from port operations**

The maintenance of the Port of Cotonou has improved considerably; management of solid waste comparable to household waste is carried out on the basis of a contract with a waste collection company. The quantity of waste, comparable to household solid waste, transported to sanitary landfills by the Autonomous Port of Cotonou during the year 2023 is estimated at 661.87 tons against 699.74 tons in 2024. Research is currently underway to establish a system for sorting the waste streams (organic and non-organic) and to develop a local recycling sector.

- **Liquid waste from port operations**

Liquid waste from port operations comes mainly from the emptying of septic tanks and sumps at the Autonomous Port of Cotonou. This liquid waste is pumped and transported to a state-approved treatment site. In total, the liquid waste collected at the PAC's administrative premises is estimated at 3600 m3 in 2023. In 2024, taking into account the public toilets installed throughout the port platform as well as the port canteen, has almost tripled the volume of waste to 11976 m3.

- **Waste comparable to household waste received at ship level**

In accordance with the provisions of Decision No. 615/PAC/DG/DGA/SG /DES/DAJD/DGTE/SAC of 4 August 2014, the Department in charge of Environmental Management regularly monitored the receipt of ships' garbage during the year. In total, one hundred and twenty (120) ships deposited their garbage during their calls at the Port of Cotonou in 2023 compared to one hundred and twenty-seven (127) ships in 2024. As for the quantity of waste received, it is estimated at 853.58 m3 in 2023 compared to 2109.65 m3 in 2024.

- **Liquid waste received from ships (waste oils/sludge)**

The removal of oil from the emptying of floating equipment from the PAC and ships is carried out by service providers approved for this purpose. The sludges are first transported to approved intermediate sites for settling. All the oils are transported to factories that use them as a source of energy. In total, 77.8 m3 of used oil were received in 2023 compared to 229.95 m3 in 2024.

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

➢ **Biomedical waste**

The amount of biomedical waste produced in the PAC infirmary is very inconsistent. This waste is received and disposed of by an approved structure.

2.6 Biodiversity management

In July 2023, the PAC developed a biodiversity management plan that aims to ensure the implementation of measures to avoid, mitigate, compensate and restore biological diversity in the area of the Port of Cotonou's modernization projects.

This document, which is very valuable for the PAC, is accompanied by an action plan whose implementation is monitored through thirty (30) indicators. Thus, as part of the implementation of this plan, several actions have been carried out. Among other actions, we can remember: the signing of memoranda of understanding with the Maritime Prefecture and a local NGO.

The rescue of stranded animals is carried out and investigations are always carried out in the event of the discovery of animal carcasses in order to identify the causes of their death. The table 6. below shows the number of stranded animals in 2023 and 2024 in the port area of Cotonou.

Table 6: Update on animals stranded in 2023 and 2024 in the port area.

YEAR	2023	2024
-	Discovery on September 20, 2023 of a dead sea turtle in putrefaction on the T5 site	Discovery on March 18, 2024 of a live sea turtle on the south bank of the port. Turtle banded and released.
	Discovery on November 20, 2023 of a dead sea turtle in putrefaction on the CHEC site	Discovery on June 1, 2024 of a dead African manatee floating on the surface of the pool
TOTAL:	**02**	**02**

Source: PAC, 2024

It appears from this table that two (2) cases of discovery of marine animals were recorded in 2023 and 2024. However, it is important to note that in the first case of 2024, it was a turtle that was still alive and was recovered, maintained and then released.

In addition, vector control to reduce invasive species such as rodents and insects is organized quarterly by the PAC. It takes into account the deratisation, pest-controlling and disinfection activities of all the premises operated by the PAC in order to fight against insects, microorganisms, rodents and all other disease vectors. These activities are carried out with the support of the Port Environmental Monitoring Platform (PPSE) (See paragraph 3.1 for more information).

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

3 MAJOR ENVIRONMENTAL INCIDENTS

The table 7. below shows the major environmental incidents recorded in 2023 and 2024. The Port of Cotonou recorded one (1) spill causing pollution of the port basin in 2023 compared to two (2) in 2024. These two incidents in 2024 come from the same source, the pipelines of a former fuel depot. As the PAC has certain equipment, all these incidents have been managed through the decontamination of contaminated sites.

The implementation of software dedicated to the monitoring and recording of spills is currently underway, as the Autonomous Port of Cotonou (PAC) does not yet have a centralized database for the management of these incidents. This initiative aims to improve data accuracy, facilitate reporting and strengthen the port's environmental monitoring and response capabilities.

Table 7: Overview of the major environmental incidents recorded in 2023 and 2024 at the port of Cotonou.

YEAR	2023	2024
INCIDENTS	Accidental spill on December 02, 2023, of vegetable oil in the port basin due to a broken hose during unloading at the ferry	Pollution of the port basin on 31 May 2024 by a product (hydrocarbon) whose origin could not be identified
		Pollution of the port basin and the sulphur pit on June 14, 2024 by fuel residues present in the BPD pipeline
TOTAL:	**01**	**02**

3.1 The port environmental monitoring platform

The PAC's Port Environmental Monitoring Platform (PPSE) is a new tool that supports port authorities in defining policies for the management of Invasive Alien Species (IAS) in Benin, particularly within the Port.

The first beneficiary of the experiences capitalized by the PPSE, the PAC through this laboratory collaborates with researchers from IRD, EPAC, IITA and the CREC (Entomological Research Center of Cotonou).

The successful results obtained by the PPSE include:

- rodent damage to goods stored at the port;

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

- the presence of pathogenic germs carried by certain rodents captured at the port of Cotonou;
- the reinforcement of the efficiency of rat control operations carried out on the port platform.

During the period 2023-2024, a total of 1,250 rodents and 5,000 insects (e.g. mosquitoes for medical reasons and other insects that may pose a threat to Beninese agriculture) were collected and examined in an entomological context. In addition, 44 water samples were examined, comprising more than one million litres of water, and 1305 marine macroinvertebrates were isolated.

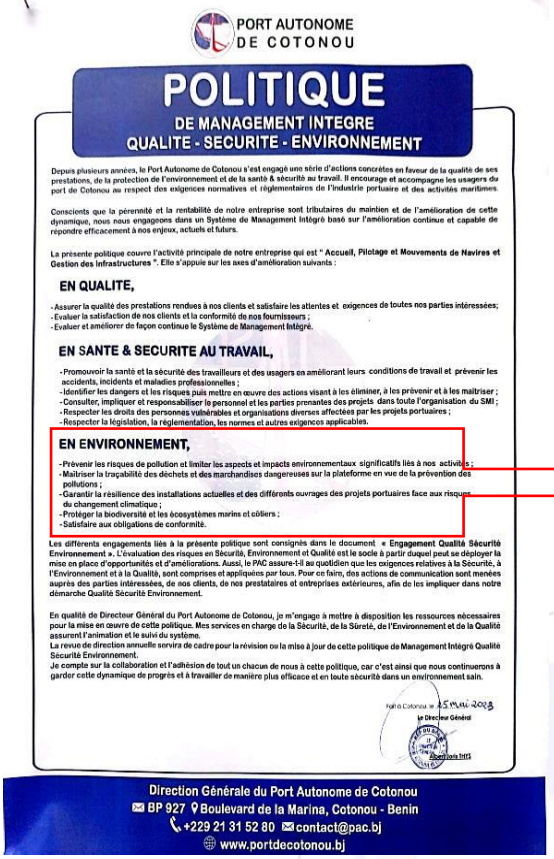
4 IMS RESULTS (RATE OF ACHIEVEMENT OF ENVIRONMENTAL OBJECTIVES)

Since 2017, the PAC has undertaken to set up and certify its management systems. Thus, in the following years:

- 2017, the Environmental Management System (EMS) of the PAC was ISO certified for the first time;
- 2017, the PAC's Quality Management System (QMS) was ISO certified and
- In 2022, the PAC's Occupational Health and Safety Management System (OHSMS) was ISO certified.

In order to improve results, promote overall system consistency and avoid redundancies, the three management systems were integrated in 2023. This system, called the Integrated Quality-Safety-Environmental Management System (IMS-QSE), has an integrated policy comprising thirteen (13) strategic axes, five (5) of which concern the environmental component (Figure 21). It is published on the PAC webpage (*https://www.portdecotonou.bj, https://portdecotonou.bj/wp-content/uploads/2023/07/POLITIQUE-DE-MANAGEMENT-DU-SYSTEME-INTEGRE-QSE.pdf*). These strategic axes relating to the environment are translated into environmental objectives to which indicators are annexed and periodically calculated. Thus, in 2023 there are fifty-four (54) indicators against fifty-three (53) in 2024. The rate of achievement of environmental objectives in 2023 is 91.77%, compared to 90.05% in 2024. More information is available in the annex.

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj



PORT AUTONOME
DE COTONOU

POLITIQUE
DE MANAGEMENT INTEGRE
QUALITE - SECURITE - ENVIRONNEMENT

Depuis plusieurs années, le Port Autonome de Cotonou s'est engagé une série d'actions concrètes en faveur de la qualité de ses prestations, de la protection de l'environnement et de la santé & sécurité au travail. Il encourage et accompagne les usagers du port de Cotonou au respect des exigences normatives et réglementaires de l'industrie portuaire et des activités maritimes.

Conscients que la pérennité et la rentabilité de notre entreprise sont tributaires du maintien et de l'amélioration de cette dynamique, nous nous engageons dans un Système de Management Intégré basé sur l'amélioration continue et capable de répondre efficacement à nos enjeux, actuels et futurs.

La présente politique couvre l'activité principale de notre entreprise qui est " Accueil, Pilotage et Mouvements de Navires et Gestion des Infrastructures ". Elle s'appuie sur les axes d'amélioration suivants :

EN QUALITE,

- Assurer la qualité des prestations rendues à nos clients et satisfaire les attentes et exigences de toutes nos parties intéressées;
- Evaluer la satisfaction de nos clients et la conformité de nos fournisseurs ;
- Evaluer et améliorer de façon continue le Système de Management Intégré.

EN SANTE & SECURITE AU TRAVAIL,

- Promouvoir la santé et la sécurité des travailleurs et des usagers en améliorant leurs conditions de travail et prévenir les accidents, incidents et maladies professionnelles ;
- Identifier les dangers et les risques puis mettre en œuvre des actions visant à les éliminer, à les prévenir et à les maîtriser ;
- Consulter, impliquer et responsabiliser le personnel et les parties prenantes des projets dans toute l'organisation du SMI ;
- Respecter les droits des personnes vulnérables et organisations diverses affectées par les projets portuaires ;
- Respecter la législation, la réglementation, les normes et autres exigences applicables.

EN ENVIRONNEMENT,

- Prévenir les risques de pollution et limiter les aspects et impacts environnementaux significatifs liés à nos activités ;
- Maîtriser la traçabilité des déchets et des marchandises dangereuses sur la plateforme en vue de la prévention des pollutions ;
- Garantir la résilience des installations actuelles et des différents ouvrages des projets portuaires face aux risques du changement climatique ;
- Protéger la biodiversité et les écosystèmes marins et côtiers ;
- Satisfaire aux obligations de conformité.

Les différents engagements liés à la présente politique sont consignés dans le document « Engagement Qualité Sécurité Environnement ». L'évaluation des risques en Sécurité, Environnement et Qualité est le socle à partir duquel peut se déployer la mise en place d'opportunités et d'améliorations. Aussi, le PAC assure-t-il au quotidien que les exigences relatives à la Sécurité, à l'Environnement et à la Qualité, sont comprises et appliquées par tous. Pour ce faire, des actions de communication sont menées auprès des parties intéressées, de nos clients, de nos prestataires et entreprises extérieures, afin de les impliquer dans notre démarche Qualité Sécurité Environnement.

En qualité de Directeur Général du Port Autonome de Cotonou, je m'engage à mettre à disposition les ressources nécessaires pour la mise en œuvre de cette politique. Mes services en charge de la Sécurité, de la Sûreté, de l'Environnement et de la Qualité assurent l'animation et le suivi du système.
La revue de direction annuelle servira de cadre pour la révision ou la mise à jour de cette politique de Management Intégré Qualité Sécurité Environnement.
Je compte sur la collaboration et l'adhésion de tout un chacun de nous à cette politique, car c'est ainsi que nous continuerons à garder cette dynamique de progrès et à travailler de manière plus efficace et en toute sécurité dans un environnement sain.

Fait à Cotonou le 15 mai 2018
Le Directeur Général

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Benin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

IN THE ENVIRONMENT,

- To prevent the risks of pollution and limit the significant environmental aspects and impacts related to our activities;
- Control the traceability of waste and hazardous goods on the platform with a view to preventing pollution;
- Guarantee the resilience of current facilities and the various structures of port projects to the risks of climate change;
- Protecting marine and coastal biodiversity and ecosystems;
- Meet compliance obligations

Figure 23. IMS-QSE policy of the PAC.

5 ENVIRONMENTAL ACTIONS AND PROJECTS

Aware of its strategic role in the national and regional economy, the Autonomous Port of Cotonou is resolutely committed to fully assuming its environmental responsibility. This commitment goes beyond simple regulatory compliance to become a real lever for continuous improvement of its ecological performance. The PAC implements concrete initiatives aimed at minimizing the impacts of its activities, restoring natural environments, and raising awareness among port stakeholders about more environmentally friendly management. By placing environmental responsibility at the heart of its priorities, the port aims not only to preserve its immediate ecosystem, but also to inspire lasting change within the local community and regional supply chains. The projects described in this section exemplify this commitment to action, transparency and environmental leadership.

- **Oil Spill Prevention and Response Initiative**

The Oil Spill Prevention and Response Initiative aims to build capacity to prepare for and respond to potential oil spill incidents in the port, as part of the port's efforts to ensure sustainable environmental management. This initiative includes three key components: training and awareness, collaboration with an external organization to clean up major oil spills, and the purchase of equipment.

To date, PAC has conducted comprehensive oil spill risk assessments to identify hazards and necessary response measures. Currently, efforts are ongoing, including communicating with the government regarding the process of contracting with an international oil spill response organisation, as well as evaluating offers to purchase equipment to ensure the necessary tools are acquired for effective oil spill management. A comprehensive training program will follow the purchase of equipment, to ensure that all relevant personnel are properly trained and know the procedures to be followed to effectively mitigate and respond to an oil spill.

- **Decarbonization and Climate Change Initiatives**

Feasibility Study for the Installation of Wind Turbines

A feasibility study is being carried out to assess the potential for the installation of five wind turbines. This study includes the use of a physical measuring tower to collect accurate data on wind conditions at the site. The objective of this initiative is to assess the viability and environmental benefits of using wind energy to reduce carbon emissions in the region. The results of the study will guide the planning and implementation of wind turbines as part of an overall decarbonization effort.

Carbon Footprint Assessment and Decarbonization Plan

The assessment of the carbon footprint of the Port of Cotonou is almost complete, only the final data of the main handling concessionaire remains. Despite this slight delay, the project has progressed well, with strong data quality from the Port's own operations and promising engagement by concessionaires in managing their emissions. Deliverables include a carbon footprint calculator to enable autonomous assessments in the future, a methodological guide on GHG metering, a decarbonization plan identifying key reduction actions, as well as a comprehensive final report summarizing the results and recommendations, which will be finalized upon receipt of the latest data. This initiative has also generated strong interest within the Port's CSR teams, with dedicated training projects and ongoing support for the next emission reporting cycles.

- **Sustainable Transformation of Vendors' Livelihoods**

The Autonomous Port of Cotonou has launched a major initiative to improve the living conditions of vendors operating near the port. Previously, these vendors faced unsafe working conditions, including exposure to traffic hazards and an unsanitary environment. In response, PAC has put in place a comprehensive community engagement program, including consultations and awareness campaigns to address the concerns and needs of vendors. As a result, a new site for vendors was inaugurated in February 2024 near the port. The site includes two halls with 250 seats each, 36 stores, 24 sales kiosks, a secondary hall with 12 seats, as well as additional commercial space. The infrastructure offers covered sales stalls, hygienic kitchens, toilets, running water, electricity and a daily waste collection service. This move resulted in a 20% increase in sales and fostered a more inclusive community environment, attracting a diverse clientele.

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

This initiative was recognized and awarded at the IAPH Sustainability Awards 2024, highlighting its positive impact on community development and social inclusion.

Website: https://sustainableworldports.org/project/port-autonome-de-cotonou-sustainable-transformation-of-vendor-livelihoods/

- **Procedures for Receiving Waste from Ships**

The Port has launched a waste management plan that sets out clear procedures for the reception and proper management of ship-generated waste.

- **Permanent monitoring of air quality through installed sensors and gauges.**

The company Airscan continuously collects data on air quality in the port area and in the surrounding areas of the city. In this way, it is possible to assess whether certain measures have an effect on the overall air quality in the port area and beyond, to the benefit of CAP employees and concessionaires, as well as local residents.

- **The development of a waste collection centre**

The PAC has made 1.5 hectares available for the development of a spillway, for the collection and possible pre-treatment of waste streams. This is done to meet the requirements of the IMO Marpol Convention in order to be able to receive all types of waste streams and to make the general waste treatment in the port area more efficient and sustainable, on the other hand. This project is a collaboration between PAC, POABI and external parties specialized in waste treatment.

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

6 CERTIFICATION ECOPORTS

In 2022, the PAC undertook the process of certification for the EcoPorts Label, which is a European initiative launched in 1997 by seaports to:

- promote the exchange of good environmental practices between ports;
- offer a management tool such as the Self Diagnostic Method (SDM) to assess the environmental impact and finally,
- supporting ports achieve PERS (Port Environmental Review System) certification, an environmental standard for ports.

At the end of this process, the Autonomous Port of Cotonou (PAC) was certified with EcoPorts Label in September 2023.

Thus, in 2022 and 2024, the PAC has completed the SDM (Self diagnostic method) questionnaire, which is a complete and effective audit tool, specifically created to be used by ports, and which allows the control of their environmental performance.

A gap analysis (Table 8) indicates whether the responses given by ports comply with the requirements of PERS, ISO 14001 and the Environmental Management System.

.

Table 8: Gap analysis between 2022 and 2024

Gap analysis *Gap analysis*	2022	2024
PERS	86.79 %	85.96 %
EMAS	84.72 %	87.50 %
ISO	88.57 %	88.57 %

Figure 24. PAC EcoPorts Certificate.

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

RECOMMENDATIONS

The following recommendations serve as **guiding principles** to be considered and pursued in the ongoing and future development of the port. They are as follows:

- Establish the carbon footprint of the Port of Cotonou;
- Establish the regulatory compliance of the concessioned sites;
- Implement a more qualitative waste management;
- Increase the amount of waste recovered;
- Intensify awareness-raising and training actions on waste separation at source;
- Establish a waste management mechanism or plan for tugs and pilots;
- Improve water quality monitoring by expanding the range of physico-chemical parameters measured;
- Initiate soil surveys at relevant locations such as sulphur deposition
- Carry out a complete energy audit;
- Finalize the process of updating the port's Emergency Response Plan (ERAP) in collaboration with the National Firefighters' Group;
- Develop a proactive environmental communication strategy towards all stakeholders;
- Establish a formal mechanism for collecting and managing environmental complaints and suggestions from stakeholders;
- Develop and implement the decarbonization plan;
- Development of an action plan to reduce air pollution by ozone, nitrogen dioxide and sulphur dioxide.

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

Table 9: Statistics of ship calls as well as the tonnage of goods of the Port of Cotonou.

		2023	2024
Ship calls	Container ship	382	324
	Dry Bulk & Cargo	154	182
	RORO	132	108
	Liquid bulk	117	111
	Passengers	3	2
	Other	23	33
Freight tonnage	Containers	6.321.352	4.294.035
	Dry Bulk & Cargo	2.055.482	2.851.717
	RORO	172.638	112.380
	Liquid bulk	1.018.405	2.412.644

Source: PAC, 2024

Direction Générale du Port Autonome de Cotonou
BP 927 Boulevard de la Marina, Cotonou - Bénin
+229 21 31 52 80 contact@pac.bj
www.portdecotonou.bj

Table 10: Environmental performance of the PAC in 2023.

PROCESS	OBJECTIVES	INDICATORS		PERIODICITY	TARGET	RESULTS ACHIEVED												PT
		No.	Indictors			JAN	FEB	MAR	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	
ENERGY STRATEGY AND MANAGEMENT (5)	**Mastering the equipment and infrastructure of the electricity network**	**19**	Up-to-date list of equipment and infrastructure of the electricity network; availability of updated plans and diagrams of the electricity network	Quarterly	100%	-	-		-	-	**100%**	-	-	**100%**	-	-	**100%**	100%
	Evaluate the electrical energy consumption on all the sites of the PAC	**20**	Up-to-date list of active meters' Control of electrical energy metering points	Quarterly	≥ 80%	-	-		-	-	**100%**	-	-	**100%**	-	-	**100%**	100%
	Evaluate all requests for energy needs addressed to the PAC	**21**	Proof of Assessment of Applications	Quarterly	100%	-	-		-	-	**100%**	-	-	**100%**	-	-	**100%**	100%
	Ensure the continuity, stability, reliability and availability of electrical power supply from the main PAC server room	**22**	Proof of availability of electrical power in the main server room; Proof of reliability of electrical energy available on computer equipment	Monthly	≥ 90%					**99%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	99,88%

	Implement a policy of continuous improvement of the services provided to users of the Port of Cotonou	**23**	Evaluation of the quality of the electricity network through survey sheets on the parameters of the network among large consumers (Consumption>= 10000 kwh)	Quarterly	≥ 70%	-	-		-	-	**100%**	-	-	**57%**	-	-	**60%**	72,33%
RECEPTION AND PILOTAGE OF SHIPS (11)	**Assist vessels with their safe entry, movement and exit**	**24**	Number of pilotage incidents	Monthly	0					**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	87,50%
		31	Number of monthly safety talks (monthly debriefing session) completed	Monthly	4					**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	100%
		32	Number of accidents and/or major incidents during manoeuvres	Monthly	0					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	100%
ENVIRONMENTAL MONITORING (7)	**Carry out planned environmental inspections**	**35**	Rate of compliance with the schedule of environmental inspections of the main operators	Annual	80%	-	-	-	-	-	-	-	-	-	-	-	**79%**	79%
		36	Rate of implementation of recommendations from environmental inspections carried out in non-concessioned areas	Monthly	80%					**86%**	**85%**	**83%**	**88%**	**86%**	**93%**	**97%**	**91%**	88,63%

	Carry out Environmental and Social Impact Assessments (ESIA) for all major PAC projects	**37**	Rate of projects that benefited from an ESIA	Annual	100%	-	-	-	-	-	-	-	-	-	-	-	**100%**	100%
	80% of bulk carriers benefit from environmental monitoring	**38**	Rate of follow-up inspection of bulk carriers completed	Monthly	80%					**82%**	**67%**	**93%**	**90%**	**100%**	**85%**	**92%**	**100%**	88,63%
	Complying with the legal requirements applicable in the port sector	**40**	Rate of compliance with the deadline for the completion of the environmental compliance audit	Annual	80%	-	-	-	-	-	-	-	-	-	-	-	**36%**	36%
		41	Number of environmental compliance initiatives undertaken	Annual	≥5	-	-	-	-	-	-	-	-	-	-	-	**6**	100%
SAFETY AND SECURITY MANAGEMENT (8)	**Preventing the risk of occupational accidents during the treatment of bulk carriers and RoRo vessels**	**42**	Rate of vessels (bulk carriers and RoRo) that have benefited from a Risk Assessment Management (RAM) inspection	Monthly	80%					**100%**	**90%**	**85%**	**100%**	**45%**	**88%**	**100%**	**100%**	88,50%
	Preventing the risk of work accidents on construction sites open on the port platform	**43**	Induction rates performed before the start of the work	Monthly	100%					**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	100%
		44	Rate of inspections carried out on construction sites in execution at the Port of Cotonou	Monthly	80%					**108%**	**138%**	**136%**	**157%**	**167%**	**120%**	**129%**	**146%**	137,63%

	Ensure the reporting of investigations of all accidents and incidents	**45**	Rate of reporting of accident and incident investigations recorded on the platform	Monthly	100%					**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	100%
		46	Implementation rate of recommendations from the investigation accident analysis	Quarterly	100%	-	-		-	-	**100%**	-	-	**100%**	-	-	**100%**	100%
	Evaluating the effectiveness of prevention actions	**47**	Rate of change in the number of incidents/accidents on the work scene between years N and N - 1	Quarterly of N compared to quarter N-1	<0	-	-		-	-	**-2**	-	-	**0**	-	-	**0**	100%
	Ensure the reporting and analysis of security incidents that have occurred at the level of IP and CCTV access	**48**	Incident Rates Analysed	Monthly	80%					**70%**	**78%**	**80%**	**100%**	**94%**	**100%**	**100%**	**81%**	87,88%
EMERGENCY MANAGEMENT (9)	**Implement recommendations from tabletop exercises**	**50**	Rate of implementation of recommendations from tabletop exercises.	Quarterly	100%	-	-	**100%**	-	-	**100%**	-	-	**100%**	-	-	**22%**	80,50%
	Preventing and controlling disasters	**51**	Rate of simulation exercises completed	Quarterly	100%	-	-	**100%**	-	-	**100%**	-	-	**100%**	-	-	**100%**	100%
		52	Rate of rounds completed	Monthly	90%					**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	100%
		53	Number of inspections of firefighting assets planned and completed	Monthly	100%					**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	100%

	Ensure compliance with laws and regulations regarding the handling, handling and removal of hazardous materials	**54**	Facility Inspection Rate Completed	Monthly	100%					**100%**	**75%**	**75%**	**100%**	**75%**	**75%**	**80%**	**75%**	81,88%
		55	Number of recorded incidents related to hazardous materials	Quarterly	0	-	-	**0**	-	-	**0**	-	-	**0**	-	-	**0**	100%
		57	The Class 1 Dangerous Goods Rate; 5.1 and 7 outings within 24 hours	Quarterly	100%	-	-	**92%**	-	-	**88%**	-	-	**100%**	-	-	**100%**	95%
EQUIPMENT AND INFRASTRUCTURE MANAGEMENT (9)	**Mastering the CIP infrastructure inventory**	**59**	Rate of infrastructures with data sheets	Quarterly	100%	-	-		-	-	**100%**	-	-	**100%**	-	-	**100%**	100%
	Execute the preventive maintenance schedule	**60**	Rate of completion of preventive maintenance actions	Quarterly	90%	-	-		-	-	**92%**	-	-	**97%**	-	-	**99%**	96%
	Responding diligently to curative interventions	**61**	Time to take charge of the recorded malfunction	Quarterly	24 hours	-	-		-	-	**4**	-	-	**4**	-	-	**4**	100%
	Ensure the ratio of at least 70% for preventive maintenance actions and 30% at most for curative maintenance actions	**62**	Ratio of preventive maintenance actions	Quarterly	70%	-	-		-	-	**85%**	-	-	**97%**	-	-	**97%**	93%
		63	Ratio of curative maintenance actions	Quarterly	30%	-	-		-	-	**15%**	-	-	**3%**	-	-	**3%**	7%
	Ensure the functional availability of the PAC's critical infrastructure	**64**	Functional availability rate of critical infrastructure	Quarterly	70%	-	-		-	-	**89%**	-	-	**89%**	-	-	**89%**	89%

	Ensure that the operation and/or maintenance of port structures and equipment do not cause any environmental nuisance	**65**	Number of environmental nuisances recorded due to the state of functionality of the structures or during maintenance work	Quarterly	0	-	-		-	-	**0**	-	-	**0**	-	-	**0**	100%
	Ensure the safety and security of third parties before any maintenance activity	**66**	Reception and safety rate achieved	Quarterly	90%	-	-		-	-	**100%**	-	-	**100%**	-	-	**0%**	66,67%
	Carry out a risk analysis before carrying out each maintenance operation	**67**	Risk assessment rate performed before the start of each maintenance operation	Quarterly	80%	-	-		-	-	**100%**	-	-	**80%**	-	-	**99%**	93%
	Adapt and integrate the S&ST and EMS Clauses to each contract	**78**	Percentage of contracts with Occupational Health and Safety Clauses and EMS	Biannual	100%	-	-	-	-	-	**100%**	-	-	-	-	-	**100%**	100%
	Organize an S&ST scoping meeting before the start of services requiring physical presence	**79**	Percentage of services that have benefited from a scoping meeting before the start of work	Biannual	100%	-	-	-	-	-	**100%**	-	-	-	-	-	**100%**	100%

	Purchase equipment, services and works that comply with the required characteristics and environmental requirements	**80**	Rate of equipment, services and work that do not comply with environmental requirements	Quarterly	0%	-	-	**0%**	-	-	**0%**	-	-	**0%**	-	-	**0%**	100%
HUMAN CAPITAL MANAGEMENT (7)	**Evaluate the effectiveness of all skills acquisition and maintenance actions**	**81**	Recruitment efficiency rate	Biannual	100%	-	-	-	-	-	**100%**	-	-	-	-	-	**100%**	100%
		82	Effectiveness Rate of Training Actions	Annual	80%	-	-	-	-	-	-	-	-	-	-	-	**95%**	95%
		84	Training completion rate	Annual	80%	-	-	-	-	-	-	-	-	-	-	-	**66%**	65%
	Evaluate the implementation of the staff performance appraisal system	**85**	Rate of completion of annual performance appraisal interviews (% of staff with an annual performance review)	Annual	100%	-	-	-	-	-	-	-	-	-	-	-	**100%**	100%
INFORMATION SYSTEMS MANAGEMENT (5)	**Analyse IT hardware needs**	**89**	Rate of coverage of computer equipment needs	Biannual	100%	-	-	-	-	-	**100%**	-	-	-	-	-		100%
WASTE MANAGEMENT (6)	**All PAC and ship operational waste as well as biomedical waste from the health centre are transported to authorized sites**	**94**	Proportion of waste receipt slips in relation to the number of port operating waste removals carried out	Monthly	100%					**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	100%

		95	Proportion of waste receipt slips in relation to the number of solid waste removals from ships carried out	Monthly	100%					**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	100%
		96	Proportions of disposal certificates in relation to the number of removals of used oils from the PAC carried out	Monthly	100%					**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	100%
		97	Proportions of disposal certificates in relation to the number of waste oil removals from ships carried out	Monthly	100%					**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	100%
		98	Proportions of receipt ticket to PAC wastewater removals completed	Monthly	100%					**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	100%
	All damaged goods removed from the port platform are destroyed in accordance with the regulations	**99**	Proportion of destruction tickets received at the PAC in relation to the number of damaged goods taken out	Quarterly	100%	-	-		-	-	**100%**	-	-	**100%**	-	-		100%

REGULATORY MONITORING PROCESS(03)	**Ensure the compliance of the Autonomous Port of Cotonou with the legal and regulatory requirements applicable to the company**	**100**	Implementation rate of the awareness schedule for the listed requirements	Biannual	100%	-	-	-	-	-	**100%**	-	-	-	-	-	**75%**	87,50%
		101	Rate of compliance with listed requirements	Annual	80%	-	-	-	-	-	-	-	-	-	-	-	**90%**	90%
		102	Number of non-conformities addressed (obligation to comply)	Annual	80%	-	-	-	-	-	-	-	-	-	-	-	**50%**	50%
															ENVIRONMENTAL PERFORMANCE			**91,77%**

Table 11: Environmental performance of the PAC in 2024.

PROCESS	OBJECTIVES	INDICATORS		PERIODICITY	TARGET	RESULTS ACHIEVED												ANNUAL RESULT
		No.	Indictors			JAN	FEB	MARCH	APRIL	MAY	JUNE	JUL	AUG	SEP	OCT	NOV	DEC	
INTEGRATED QSE SYSTEM MANAGEMENT	Assess the satisfaction of PIPs (Environmental and OHS)	9	Overall satisfaction rate of PIPs	Annual	70%	-	-	-	-	-	-	-	-	-	-	-	82%	82,00%
CUSTOMER SATISFACTION	Satisfy customers	16	Customer satisfaction rate	Annual	80%	-	-	-	-	-	-	-	-	-	-	-	82%	82,00%
	Handling customer complaints	17	Average customer complaint processing time	Monthly	7 days	0	0	0	1	0	0	0	0	0	0	0	0	100,00%
	Satisfactorily deal with all well-founded claims from the PAC	18	Rate of substantiated customer complaints satisfied within 15 days	Monthly	100%	100 %	100 %	100%	100%	100 %	100 %	100 %	100%	100 %	100 %	100 %	100 %	100,00%
ENERGY STRATEGY AND MANAGEMENT (5)	Mastering the equipment and infrastructure of the electricity network	19	Up-to-date list of electricity network equipment and infrastructure ;D availability of updated electricity network plans and diagrams	Quarterly	100%	-	-	100%	-	-	100 %	-	-	100 %	-	-	100 %	100,00%
	Evaluate the electrical energy consumption on all the sites of the PAC	20	Up-to-date list of active meters; Control of electrical energy metering points	Quarterly	≥ 80%	-	-	100%	-	-	100 %	-	-	100 %	-	-	100 %	100,00%
	Evaluate all requests for energy needs addressed to the PAC	21	Proof of Assessment of Applications	Quarterly	100%	-	-	100%	-	-	100 %	-	81%	100 %	-	-	100 %	100,00%

	Ensure the continuity, stability, reliability and availability of electrical power supply from the main PAC server room	**22**	Proof of availability of electrical power in the main server room; Proof of reliability of electrical energy available on computer equipment	Monthly	≥ 90%	**100 %**	**99%**	**100%**	**99%**	**100 %**	**100 %**	**100 %**	**100%**	**100 %**	**100 %**	**100 %**	**100 %**	99,83%
	Implement a policy of continuous improvement of the services provided to users of the Port of Cotonou	**23**	Evaluation of the quality of the electricity network through survey sheets on the parameters of the network among large consumers (Consumption>= 10000 kwh)	Quarterly	≥ 70%	-	-	**75%**	-	-	**100 %**	-	-	**75%**	-	-	**75%**	81,25%
RECEPTION AND PILOTAGE OF SHIPS (11)	**Assist vessels with their safe entry, movement and exit**	**24**	Number of pilotage incidents	Monthly	0	**0**	**1**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	83,33%
	Ensure the effectiveness and effectiveness of the awareness of those involved in the reception and pilotage activities of ships	**30**	Rate of pre-start checklists per working day	Monthly	100%	**100 %**	**100 %**	**100%**	**100%**	**100 %**	**100 %**	**100 %**	**100%**	**100 %**	**100 %**	**100 %**	**100 %**	100,00%
		31	Number of monthly safety talks (monthly debriefing session) completed	Monthly	4	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**0**	**0**	**0**	**0**	66,67%
		32	Number of accidents and/or major incidents during manoeuvres	Monthly	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	91,67%
ENVIRONMENTAL MONITORING (7)	**Carry out planned environmental inspections**	**35**	Rate of compliance with the schedule of environmental inspections of the main operators	Annual	80%	-	-	-	-	-	-	-	-	-	-	-	**80%**	80,00%

		36	Rate of implementation of recommendations from environmental inspections carried out in non-concessioned areas	Monthly	90%	**96%**	**89%**	**85%**	**84%**	**85%**	**90%**	**96%**	**95%**	**92%**	**91%**	**93%**	**93%**	90,75%
	Carry out Environmental and Social Impact Assessments (ESIA) for all major PAC projects	**37**	Rate of projects that benefited from an ESIA	Annual	100%	-	-	**1**	-	-	**0**	-	-	**1**	-	-	**1**	75,00%
	80% of bulk carriers benefit from environmental monitoring	**38**	Rate of follow-up inspection of bulk carriers completed	Monthly	80%	**60%**	**93%**	**100%**	**86%**	**87%**	**100 %**	**83%**	**86%**	**94%**	**91%**	**94%**	**93%**	88,92%
	Complying with the legal requirements applicable in the port sector	**40**	Rate of compliance with the deadline for the completion of the environmental compliance audit	Annual	80%	-	-	-	-	-	-	-	-	-	-	-	**100 %**	100,00%
SAFETY AND SECURITY MANAGEMENT (8)	**Preventing the risk of occupational accidents during the treatment of bulk carriers and RoRo vessels**	**42**	Rate of vessels (bulk carriers and RoRo) that have benefited from a Risk Assessment Management (RAM) inspection	Monthly	80%	-	-	-	-	-	-	-	-	-	-	-	**100 %**	100,00%
	Preventing the risk of work accidents on construction sites	**43**	Induction rates performed before the start of the work	Monthly	100%	**100 %**	**100 %**	**100%**	**100%**	**100 %**	**100 %**	**100 %**	**100%**	**100 %**	**100 %**	**100 %**	**100 %**	100,00%

	open on the port platform	**44**	Rate of inspections carried out on construction sites in execution at the Port of Cotonou	Monthly	80%	**100 %**	**100 %**	**100%**	**100%**	**100 %**	**100 %**	**100 %**	**100%**	**100 %**	**100 %**	**100 %**	**100 %**	100,00%
	Ensure the reporting of investigations of all accidents and incidents	**45**	Rate of reporting of accident and incident investigations recorded on the platform	Monthly	100%	**100 %**	**100 %**	**100%**	**92%**	**100 %**	**100 %**	**100 %**	**100%**	**100 %**	**100 %**	**100 %**	**100 %**	99,33%
		46	Implementation rate of recommendations from the investigation accident analysis	Monthly	100%	**25%**	**42%**	**42%**	**71%**	**44%**	**53%**	**35%**	**38%**	**71%**	**35%**	**44%**	**71%**	47,58%
	Ensure the reporting and analysis of security incidents that have occurred at the level of IP and CCTV access	**47**	Incident Rates Analysed	Monthly	80%	**100 %**	**100 %**	**100%**	**100%**	**100 %**	**100 %**	**100 %**	**100%**	**100 %**	**100 %**	**100 %**	**100 %**	100,00%
EMERGENCY MANAGEMENT (9)	**Implement recommendations from tabletop exercises**	**50**	Rate of implementation of recommendations from tabletop exercises.	Monthly	100%	**100 %**	**100 %**	**100%**	**100%**	**100 %**	**100 %**	**100 %**	**100%**	**100 %**	**100 %**	**100 %**	**100 %**	100,00%
	Preventing and controlling disasters	**51**	Rate of simulation exercises completed	Quarterly	100%	-	-	**0%**	-	-	**64%**	-	-	**90%**	-	-	**88%**	60,50%
		53	Number of inspections of firefighting assets planned and completed	Quarterly	100%	-	-	**100%**	-	-	**67%**	-	-	**67%**	-	-	**100 %**	83,50%
	Ensure compliance with laws and regulations regarding	**54**	Facility Inspection Rate Completed	Monthly	100%	**100 %**	**100 %**	**100%**	**100%**	**100 %**	**100 %**	**100 %**	**100%**	**100 %**	**100 %**	**100 %**	**100 %**	100,00%

	the handling, handling and removal of hazardous materials.	**55**	Number of recorded incidents related to hazardous materials.	Monthly	0	**100 %**	**100 %**	**100%**	**100%**	**100 %**	**100 %**	**100 %**	**100%**	**100 %**	**100 %**	**100 %**	**100 %**	100,00%
		56	The quantity of dangerous goods by class transited through the Port of Cotonou	Monthly	Volume	**100 %**	**100 %**	**100%**	**100%**	**100 %**	**100 %**	**60%**	**100%**	**0%**	**80%**	**50%**	**75%**	80,42%
EQUIPMENT AND INFRASTRUCTURE MANAGEMENT (9)	**Mastering the CIP infrastructure inventory**	**59**	Rate of infrastructures with data sheets	Quarterly	100%	-	-	**100%**	-	-	**100 %**	-	-	**100 %**	-	-	**100 %**	100,00%
	Execute the preventive maintenance schedule	**60**	Rate of completion of preventive maintenance actions	Quarterly	90%	-	-	-	-	-	**14%**	-	-	-	-	-	**90%**	57,00%
	Responding diligently to curative interventions	**61**	Time to take charge of the recorded malfunction	Quarterly	24 hours	-	-	**92%**	-	-	**96%**	-	-	**97%**	-	-	**92%**	94,25%
	Ensure the ratio of at least 70% for preventive maintenance actions and 30% at most for curative maintenance actions	**62**	Ratio of preventive maintenance actions	Quarterly	70%	-	-	**89%**	-	-	**96%**	-	-	**100 %**	-	-	**92%**	94,25%
		63	Ratio of curative maintenance actions	Quarterly	30%	-	-	**11%**	-	-	**4%**	-	-	**0%**	-	-	**8%**	5,57%
	Ensure the functional availability of the PAC's critical infrastructure	**64**	Functional availability rate of critical infrastructure	Quarterly	70%	-	-	**86%**	-	-	**86%**	-	-	**88%**	-	-	**84%**	86,00%

	Ensure that the operation and/or maintenance of port structures and equipment do not cause any environmental nuisance	**65**	Number of environmental nuisances recorded due to the state of functionality of the structures or during maintenance work	Quarterly	0	-	-	**0**	-	-	**0**	-	-	**0**	-	-	**0**	100,00%
	Ensure the safety and security of third parties before any maintenance activity	**66**	Reception and safety rate achieved	Quarterly	90%	-	-	**100%**	-	-	**100 %**	-	-	**100 %**	-	-	**100 %**	100,00%
	Adapt and integrate the S&ST and EMS Clauses to each contract	**78**	Percentage of contracts with Occupational Health and Safety Clauses and EMS	Biannual	100%	-	-	-	-	-	**100 %**	-	-	-	-	-	**100 %**	100,00%
	Organize an S&ST scoping meeting before the start of services requiring physical presence	**79**	Percentage of services that have benefited from a scoping meeting before the start of work	Biannual	100%	-	-		-	-	**100 %**	-	-		-	-	**100 %**	100,00%
	Purchase equipment, services and works that comply with the required characteristics and environmental requirements	**80**	Rate of equipment, services and work that do not comply with environmental requirements.	Quarterly	0%	-	-	-	-	-	**100 %**	-	-	-	-	-	**100 %**	100,00%
HUMAN CAPITAL MANAGEMENT (7)	**Evaluate the effectiveness of all**	**81**	Recruitment efficiency rate	Biannual	100%	-	-	-	-	-	-	-	-	-	-	-	**99%**	99,00%

	skills acquisition and maintenance actions	**83**	Effectiveness Rate of Training Actions	Annual	100%	-	-	-	-	-	-	-	-	-	-	-	**82%**	82,00%
		84	Training completion rate	Annual	80%	-	-	-	-	-	-	-	-	-	-	-	**100 %**	100,00%
	Participate in the management of pension provision and social relations	**88**	Overall employee satisfaction rate	Annual	80%	**100 %**	**100 %**	**86%**	**87%**	**97%**	**100 %**	**100 %**	**100%**	**99%**	**99%**	**100 %**	**100 %**	97,33%
WASTE MANAGEMENT (6)	**All PAC and ship operational waste as well as biomedical waste from the health centre are transported to authorized sites**	**94**	Proportion of waste receipt slips in relation to the number of port operating waste removals carried out	Monthly	100%	**100 %**	**100 %**	**100%**	**100%**	**100 %**	**100 %**	**100 %**	**100%**	**100 %**	**100 %**	**100 %**	**100 %**	100,00%
		95	Proportion of waste receipt slips in relation to the number of solid waste removals from ships carried out	Monthly	100%	**100 %**	**100 %**	**100%**	**100%**	**100 %**	**100 %**	**100 %**	**100%**	**100 %**	**100 %**	**100 %**	**100 %**	100,00%
		96	Proportions of disposal certificates in relation to the number of removals of used oils from the PAC carried out	Monthly	100%	**56%**	**100 %**	**100%**	**100%**	**100 %**	**100 %**	**100 %**	**100%**	**100 %**	**100 %**	**100 %**	**100 %**	96,33%

		97	Proportions of disposal certificates in relation to the number of waste oil removals from ships carried out	Monthly	100%	**100 %**	**100 %**	**100%**	**100%**	**100 %**	**100 %**	**100 %**	**100%**	**100 %**	**100 %**	**100 %**	**100 %**	100,00%
	All damaged goods removed from the port platform are destroyed in accordance with the regulations	**99**	Proportion of destruction tickets received at the PAC in relation to the number of damaged goods taken out	Biannual	100%	-	-	-	-	-	**100 %**	-	-	-	-	-	**100 %**	100,00%
REGULATORY MONITORING PROCESS (3)	**Ensure the compliance of the Autonomous Port of Cotonou with the legal and regulatory requirements applicable to the company**	**100**	Implementation rate of the awareness schedule for the listed requirements	Biannual	100%	-	-	-	-	-	100 %	-	-	-	-	-	**80%**	90,00%
		101	Rate of compliance with listed requirements	Annual	80%	-	-	-	-	-	-	-	-	-	-	-	**90%**	90,00%
		102	Number of non-conformities addressed (obligation to comply)	Annual	80%	-	-	-	-	-	-	-	-	-	-	-	**88%**	88,00%
												PERFORMANCE ENVI						**90,05 %**