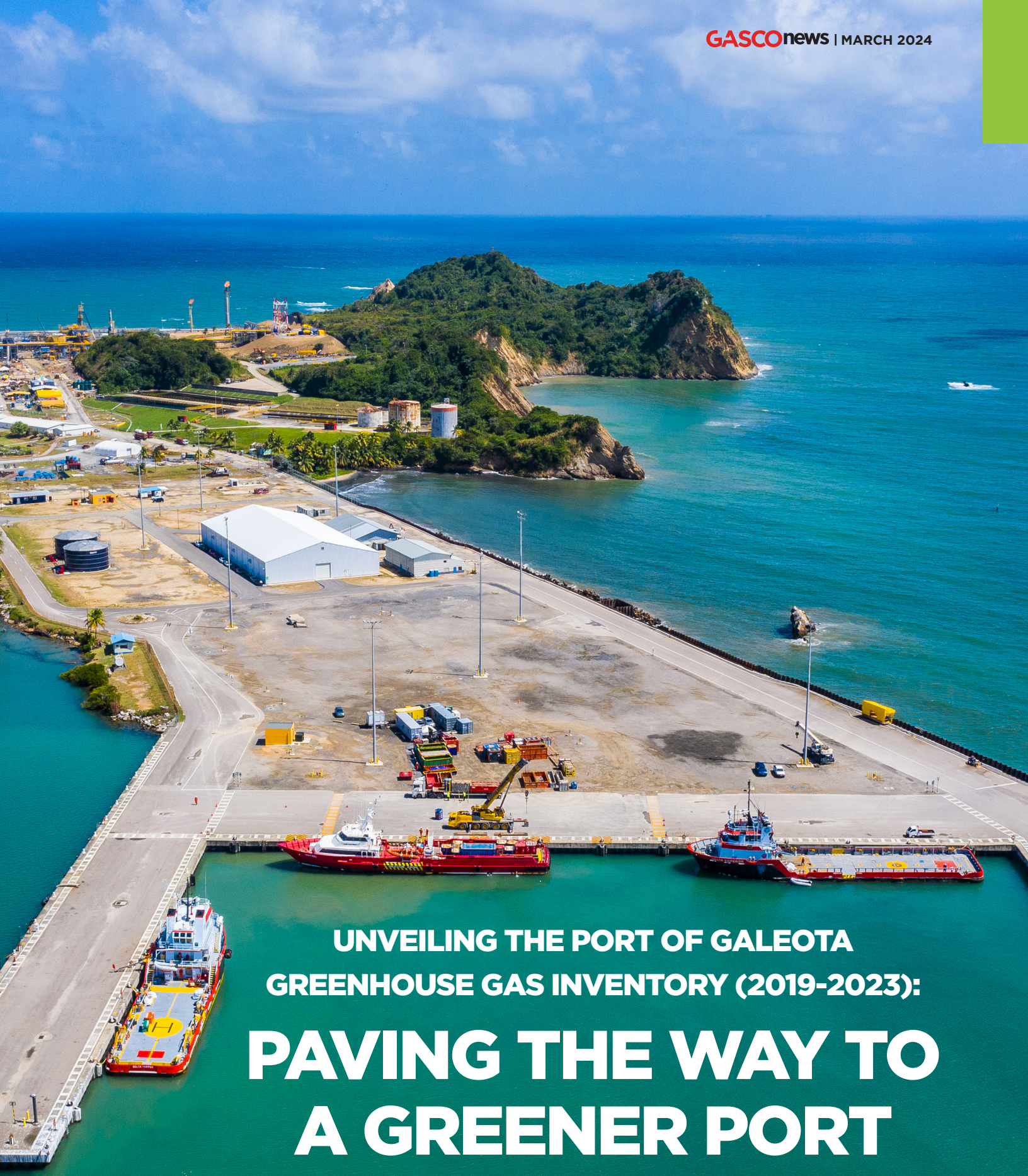

UNVEILING THE PORT OF GALEOTA GREENHOUSE GAS INVENTORY (2019-2023):

PAVING THE WAY TO A GREENER PORT

Estimated read time: 10 min

ON THE GREEN AGENDA

KEY TAKEAWAYS

National Energy conducted a GHG inventory at its Port of Galeota to begin the quantification of emissions and develop an emissions reduction strategy for the facility.

The inventory assessed Scope 1, 2 and 3 emissions from 2019 to 2023.

Results identified opportunities for mitigation in both ship- and shore-based activities.

The Port of Galeota (POG) is an industrial port owned and operated by National Energy Corporation of Trinidad and Tobago Limited (National Energy). The port is a multi-purpose facility, located on the southeastern coast of Trinidad, strategically positioned to service the oil and natural gas upstream companies involved in deep water offshore exploration and production activities in the Columbus Basin.

Because of the global push to lower emissions from port activities, due to the increasing awareness that these operations are significant contributors of greenhouse gas (GHG) emissions, organisations such as the International Maritime Organization (IMO) have embraced the "2023 IMO Strategy on the Reduction of GHG Emissions from Ships" framework. This IMO Strategy offers guidance on curbing emissions linked to port operations within the maritime industry.

THE INTERNATIONAL TRANSPORT FORUM AND ORGANISATION FOR ECONOMIC COOPERATION AND DEVELOPMENT CITE THAT PORT ACTIVITIES CONTRIBUTE UP TO **5%** OF THE OVERALL GHG EMISSIONS IN THE MARITIME SECTOR.

This only underscores the importance of implementing measures, both onshore and offshore, to minimise the port's environmental impact.

Port of Galeota

In doing so, it will also serve as a measure to assist Trinidad and Tobago in meeting its Nationally Determined Contribution (NDC) commitment for the reduction of emissions by 15% by 2030 in the transportation sector.

As part of its collective sustainability thrust, National Energy took a strategic decision to conduct a GHG inventory at its POG to begin the quantification of emissions and allow for an emission reduction strategy (ERS) to be implemented. This strategy allows for recommendations to be put forward to arrive at more energy efficient operational measures for the port, with regular monitoring and assessments done on their performance. National Energy, and by extension the NGC Group of Companies, is no stranger to the facilitation of GHG inventories, having already collaborated with The University of Trinidad and Tobago (UTT) for the completion of assessments at La Brea Industrial Development Company Limited's (LABIDCO's) Port of Brighton and National Energy's Savonetta Piers. These projects highlight an already established relationship between the NGC Group and UTT, in accordance with a Memorandum of Understanding (MOU) for climate change mitigation.

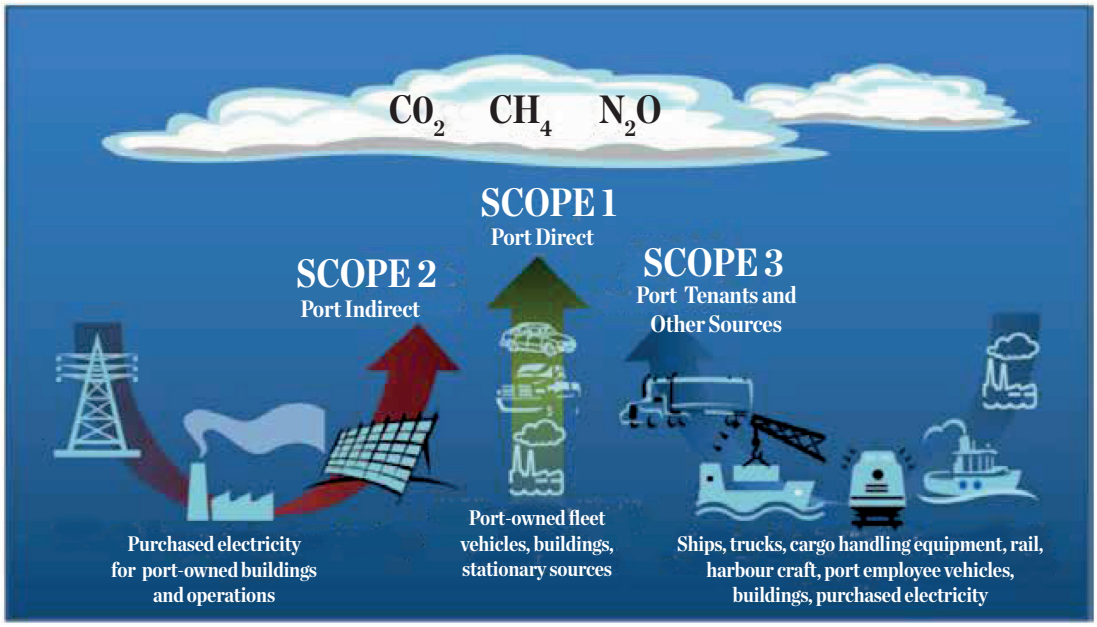

Figure 1: Port-related GHG emissions sources by scope[1]

In September 2023, UTT was therefore further engaged to undertake an assessment to develop a GHG inventory for POG. The assessment was based on the collection of data for the period January 2019 – June 2023. This project aligns with the NGC Group's already established Green Agenda, which focuses on the reduction of our corporate carbon footprint and supports the pursuit of Trinidad and Tobago's NDCs. Furthermore, the completion of this assessment provides an opportunity for POG to attain 'Green Port' Certification.

There is no universally accepted definition of a Green Port, yet it can be understood as the result of a long-term strategy aimed at developing sustainable port infrastructure and promoting environmentally conscious operations. The Green Port Certification, driven by the increasing significance of Environmental, Social, and Governance (ESG) factors in investment decision-making, is a response to growing environmental awareness and the pressing need to reduce GHG emissions from port and maritime operations due to their effects on climate change. Attainment of this Certification requires implementation of various measures such as:

- emissions reduction strategies
- waste management practices
- water conservation efforts
- biodiversity conservation
- community engagement
- regulatory compliance, and
- obtaining relevant certifications.

It plays a crucial role in showcasing a port's commitment to environmental stewardship, enhancing its competitiveness, ensuring regulatory compliance, achieving cost savings and efficiency improvements, and fostering positive community and stakeholder relations.

The POG aims to gain a competitive advantage as a regional Green Port to benefit National Energy and the local community, whilst protecting the marine environment and sensitive ecosystems in the Guayaguayare Bay, in tandem with improving port operations. This transition will require short, medium and long-term initiatives to achieve the required results, but will ultimately increase the port's business resilience, attracting more opportunities for its growth and development.

SCOPE 1, 2 AND 3 GHG EMISSIONS

The GHG assessment conducted at the POG offers a thorough analysis of the GHG emissions linked to the port's maritime operations. It focuses on quantifying emissions of three key gases: Carbon Dioxide (CO_2), Methane (CH_4), and Nitrous Oxide (N_2O).

[1] Source: https://www.imo.org/en/MediaCentre/PressBriefings/Pages/17GoMEEPguides.aspx

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The report covers six source categories: power generation, cargo handling equipment, harbour crafts, ocean-going vessels, light-duty vehicles, and heavy-duty vehicles. Additionally, it includes a detailed analysis of activity data and information used to determine activity rates, emission factors, and reduction factors for each source category. Overall, the GHG assessment delivers valuable insights into GHG emissions associated with the POG's maritime operations and highlights key areas for future emissions reduction.

The GHG assessment at the POG is categorised into three scopes defined by the Intergovernmental Panel on Climate Change (IPCC) and shown in Figure 1 (page 15).

Scope 1: This methodology involves direct measurement and quantification of emissions from sources owned or controlled by POG, such as port-owned on-road fleet vehicles, harbour crafts, and ocean-going vessels. Relevant activity data and information are collected to determine activity rates, emission factors, and reduction factors for each source category under the port's direct operational control.

Scope 2: For Scope 2 emissions, the methodology assesses indirect emissions from the consumption of purchased electricity used by POG. This analysis includes examining energy consumption data and associated emissions from purchased electricity used in port operations.

Scope 3: The methodology also includes assessing Scope 3 emissions, which encompasses other indirect emissions occurring in the value chain of POG's activities. This involves quantifying emissions from cargo handling equipment, as well as light-duty and heavy-duty vehicles used by tenants or National Energy employees, thus providing a comprehensive view of the port's entire GHG footprint. The Galeota

SCOPE / SOURCE TYPE	Scope 1 – Port Direct Sources	Scope 2 – Port Indirect Sources	Scope 3 – Other Indirect Sources
MOBILE	Harbour crafts fleet		Cargo handling equipment (port tenants)
	Ocean-going vessels fleet		Light-duty on-road vehicles (port employees and tenants' employees)
	On-road vehicles fleet		Heavy-duty on-road vehicles (port tenants)
STATIONARY		Purchased Electrical Energy	

Table 1: GHG Inventory Categories, Scopes and Types

inventory is unique from previous inventories in that it attempts to encompass Scope 3 variables.

By categorising the GHG assessment into these three Scopes, as shown in Table 1, the report provided a thorough analysis of greenhouse gas emissions associated with POG's maritime operations, covering both direct and indirect emissions. This approach enables a comprehensive understanding of POG's carbon footprint and forms the basis for developing effective strategies to reduce emissions in the future.

DISCUSSION/FINDINGS

Figure 2 gives an overview of GHG emissions for the four (4) years placed under analysis, and focuses on the emissions of carbon dioxide, methane and nitrous oxide. A gradual decrease in emissions was observed from 2019 to 2021, with a percentage decrease of 24.18% between the period 2019 to 2020, followed by a percentage decrease of 4.67% between 2020 and 2021. However, for the period 2021 to 2022, an increase of 88.41% was observed.

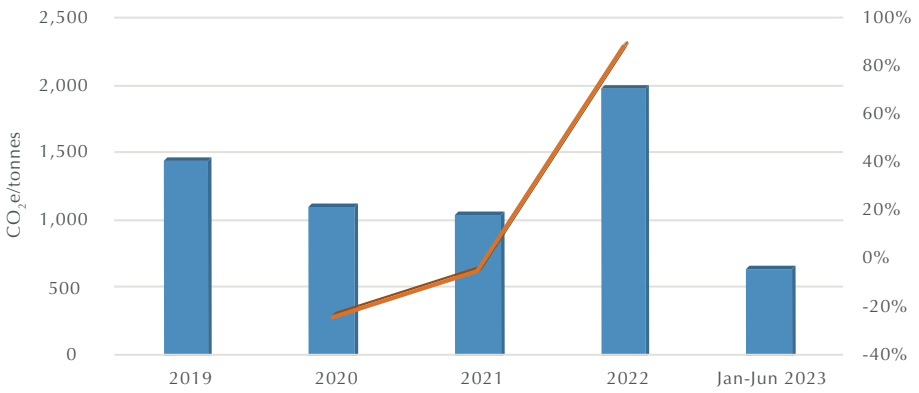

Figure 2: CO_2 equivalent emissions estimate for the period of study

These trends were due to the onset and aftermath of the COVID-19 pandemic, which in its earlier stages resulted in an overall decrease in activity on the port. The resumption of almost regular economic activity led to the rise in emissions during the latter part of the pandemic.
Based on the assessment, results were further arranged by percentile to give an indication of which category contributed the most to GHG emissions at POG for the inventory period.

As seen in Figure 3, ocean-going vessels were the most significant contributor to GHG emissions, coming in at 72.22%, with harbour crafts accounting for 3.38%. Based on these two figures, sea-based activities for the port contributed to 75.60% of total emissions, with the remaining 24.4% of emissions coming from shore-based activities. The contributing shore-based activities included power generation (19.55%), cargo handling equipment (4.54%), heavy-duty vehicles (0.21%) and light-duty vehicles (0.09%).

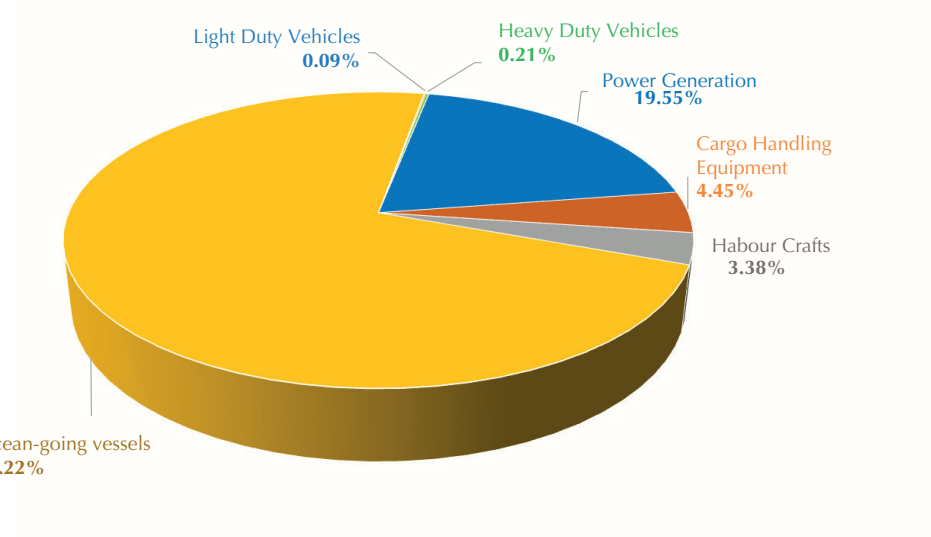

Figure 3: GHG Emissions Estimate by Category.

RECOMMENDATIONS

Emissions Reduction Strategy
Upon conclusion of the GHG inventory for the POG, key sources of GHG emissions were identified, to facilitate the development of an Emissions Reduction Strategy. This strategy outlined in Figure 4 entails setting targets and incorporates key performance indicators (KPIs) to initiate the mitigation of emissions. It will allow for a gauge of the impact of strategies put forward to assist in the overall reduction of emissions at POG.

Figure 4: Emissions Reduction Strategy Procedure (Source: GEF-UNDP-IMO GloMEEP Project and IAPH, 2018: Port Emissions Toolkit, Guide No.2.)

Shore-based activities
In terms of shore-based activities, reducing overall impact will involve swapping to more efficient equipment and upgrading to the newest available technologies. Additionally, an upgrade to more efficient operational measures, practices and procedures, including maintenance scheduling, can be pursued.

On-shore equipment utilised at POG includes electrical equipment, which contributed 19.55% of the annual GHG emissions estimated for the period under assessment.

To assist in the reduction of this figure, the use of newer, more energy efficient HVAC systems can lower the impact from the air-conditioning equipment. Also, switching to more efficient lighting systems can also aid in the reduction of the emissions figure due to power generation.

ON THE GREEN AGENDA

In the move towards more sustainable methods of power generation, the incorporation of green/renewable energy at POG can be considered. The introduction of systems involving solar panel arrays and wind turbines can reduce the dependency on the national power grid. These measures can be implemented gradually and ramped up over time to bring a new perspective for the port's expansion and development.

Harbour Craft
The emissions associated with the operation of the harbour craft at POG can be reduced through introduction of new technologies, such as electrification/hybridisation, to assist in the abatement of their pollutants. However, implementation of these new technologies to National Energy's vessels requires retrofitting, which will incur capital expenditure. National Energy has already begun the process of transitioning to cleaner harbour craft technologies.

THE LATEST FLEET ACQUISITION, THE NATIONAL ENERGY RESILIENCE, IS IMO TIER III-CERTIFIED, PRODUCING **80%** LESS NITROUS OXIDES.

Ocean-going vessels
Ocean-going vessels contribute significantly to the emissions at POG, as the port sees frequent activity from berthing.

THE INTRODUCTION OF SHORE-BASED POWER FOR OCEAN-GOING VESSELS CAN REDUCE EMISSIONS UP TO **98%.**

This measure can be effective as vessels that call at the port do not require any extensive amount of power, as opposed to those of a larger size that frequent commercial ports. Additionally, generation of renewable power through alternative energy systems can be explored.

Heavy Duty & Light Duty Vehicles
The results obtained from the assessment also encompassed the utilisation/operation of on-road heavy-duty and light-duty vehicles within the port. It was found that these vehicles do not contribute significantly towards the port's GHG emissions. This is due to the relatively short distances necessary to travel to strategic locations on the port. However, to curb these emissions, compressed natural gas (CNG) or electric vehicles can be used. This recommendation is applicable across the entire local transportation sector. Efforts can also be made to encourage port users to move towards the utilisation of greener drive trains for their fleets.

Improvement of Inventory Quality
Other initiatives which can be considered for overall improvement in the efficiency of gathering data at the port include port digitalisation and the continuous improvement of the GHG data inventory quality.

- Port digitalisation will allow for the transition of POG to a smart port, through enhanced port operation monitoring. This will accelerate the process and assist in the improvement of data gathering.
- This improvement will supplement the continuous update of the inventory for POG, to further build upon the recent successful completion. The fulfilment of this inventory provided a snapshot of all operations at the port and their contribution to annual emissions. However, subsequent revisions of the inventory will allow for a more robust collection of data, to improve the accuracy of the findings presented, and build upon the recommendations.

CONCLUSION

The GHG inventory report serves as a valuable tool for the POG to understand its GHG emissions profile and take proactive steps towards sustainability. By implementing the recommendations outlined in the report, the port can work towards reducing its environmental impact, promoting energy efficiency, and contributing to a more sustainable maritime industry. ■