Results, challenges, and recommendations associated with transition to Green Ports

IMO CARES - Maritime Technology Cooperation Centre (MTCC) for Latin America – International Maritime University of Panama

International Virtual Workshop on “Maritime Decarbonization – R & D in Latin America and Global Perspectives”

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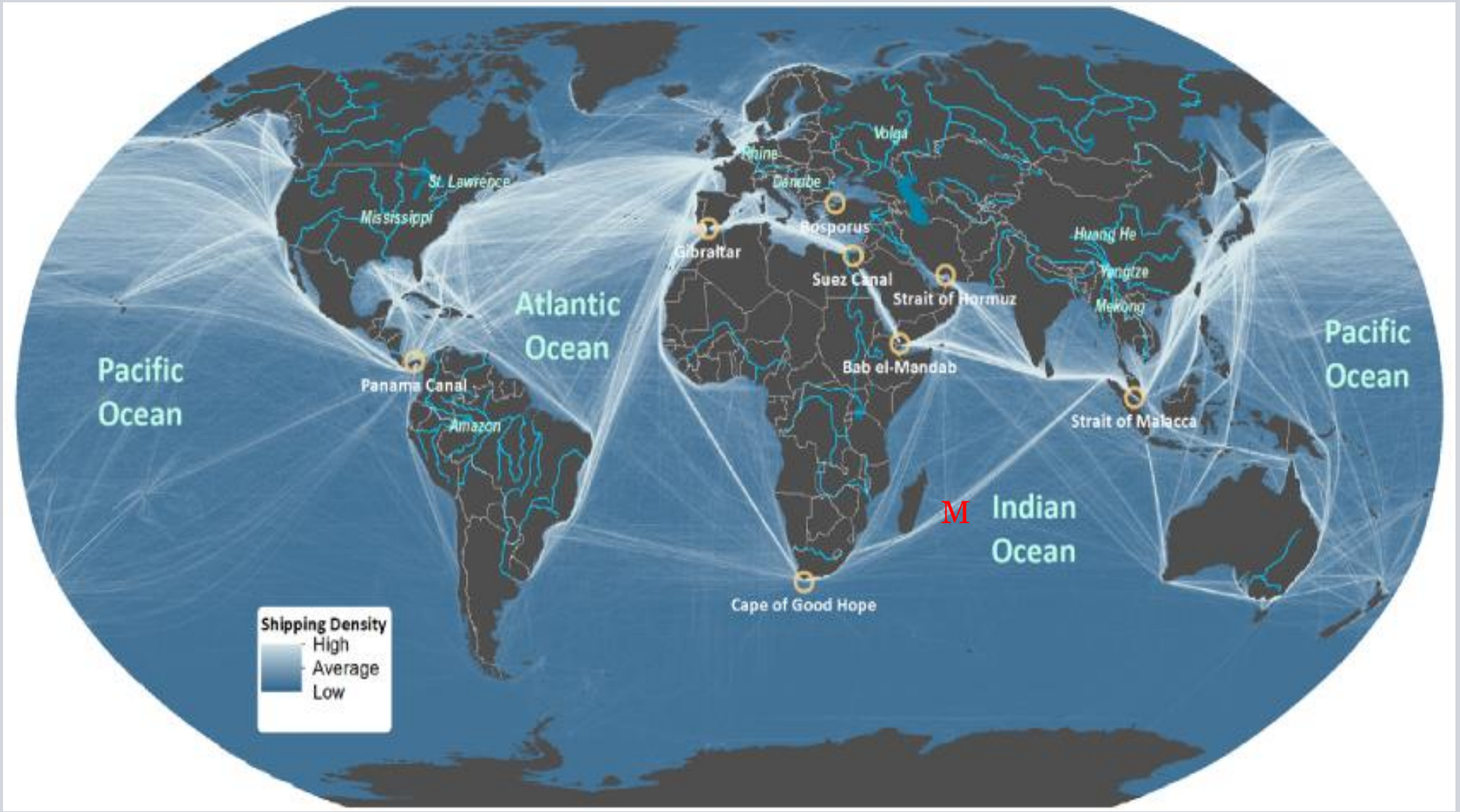
Agenda

- A brief overview of Port Louis Harbour, Mauritius
- Greenport Initiatives at Port Louis Harbour
- Key drivers for clean energy transition towards the Green Port Concept
- Results, Challenges, Opportunities & Way Forward
- Energy transition at Port Louis Harbour – a Case Study

Port Louis Harbour in the Context of Global Shipping Routes



Source: Shipping density data adapted from National Center for Ecological Analysis and Synthesis, A Global Map of Human Impacts to Marine Ecosystems.

- Mauritius is located at the intersection of several different main shipping lanes, ideal for hub-and-spoke transhipment to East Africa and other Indian Ocean islands, as well as relay transhipment for longer distance routes.

Bulk Imports

Petroleum Products Imports & Bunkering Services

LPG Storage and Distribution

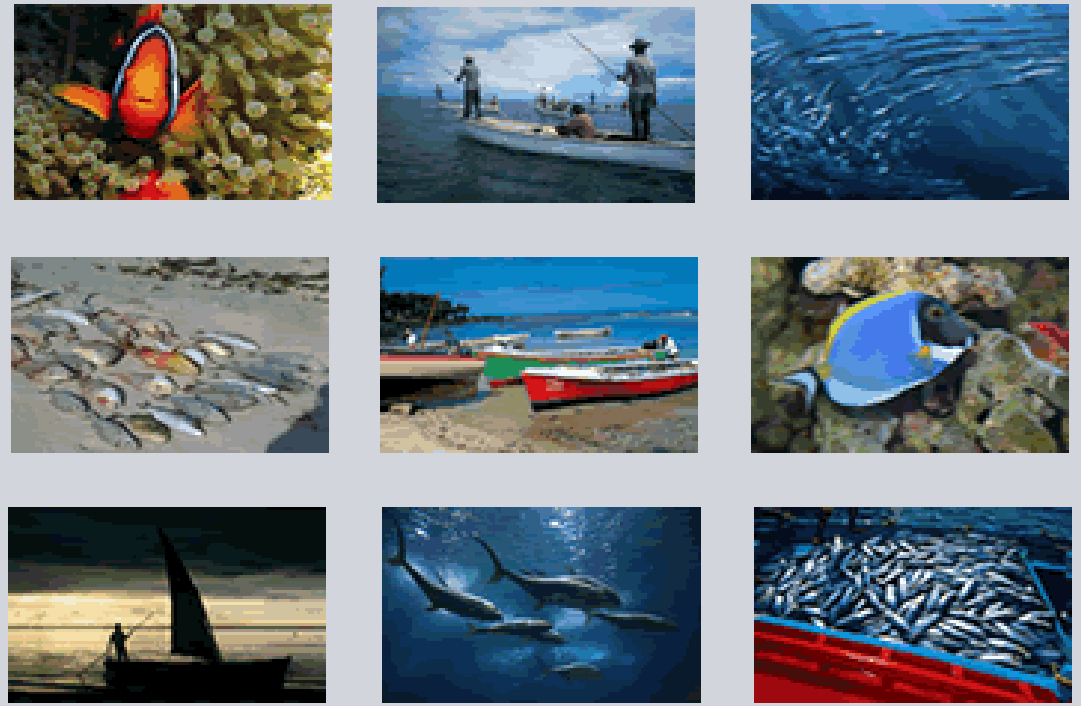
Sugar




Cruise Vessels at Port Louis Harbour

Dry Docking & Ship Repairs

Trou Fanfaron Fishing Port



Fisheries

Sensitivity of Port Louis Harbour

- Strategically located at the crossroad of main maritime routes b/w Far East & Africa and Europe & Australia
- Country's only maritime gateway for External trade (99%)
- Contribute 2% to the country's GDP
- Vital connection for Indian Ocean islands & peripheral regions

Port Trade Performance
Key Figures at a glance

Total Trade Volume	**7.7**	**Million tonnes**	**(+0.5%)**
• **Containerised Cargo**	3.9	Million tonnes	**(+7.0%)**
• **Dry Bulk Cargo**	1.9	Million tonnes	**(+15.1%)**
• **Liquid Bulk Cargo**	1.9	Million tonnes	**(-17.2%)**
• **Fish Traffic**	98,961	tonnes	**(-29.1%)**
Total Container Traffic	**463,044**	**TEUs**	**(+7.8%)**
• **Captive Container**	229,772	TEUs	**(-10.1%)**
• **Transhipment Container Inwards**	233,272	TEUs	**(+34.0%)**
• **Transhipment Container Outwards**	227,353	TEUs	**(+29.8%)**
Total Container Throughput (incl. paid restows)	**697,345**	**TEUs**	**(+13.9%)**
Total Vessel Traffic	2,628	calls	**(-21.0%)**
• **Containerised Vessels**	494	calls	**(+1.4%)**
• **Fishing Vessels**	752	calls	**(-24.1%)**
Cruise Traffic	**Cruise activities suspended due to COVID-19 pandemic**		
Total Bunker Traffic	**614,113**	**tonnes**	**(-11.3%)**
• **Pipeline**	66,276	tonnes	**(-31.6%)**
• **Barges**	**547,837**	**tonnes**	**(-8.0%)**

Cruise Terminal Building by end of Feb 2023

Based on a forecast in 2016, the numbers of cruise vessel calls and passengers were expected to increase to 60 and 60,000 respectively by 2025.

The facility will comprise the passenger terminal, commercial areas, office space including parking facilities.

The preferred development option is estimated at about Rs 830 million & the project is expected to be completed end of Feb 2023.

Transition to clean energy in ports
The global context

Maritime transport accounts 80% of global merchandise trade by volume

Shipping is responsible for about 3 % of global GHG emissions

GHG emissions increased by 32 % over the past 20 years

Emissions are expected to increase between 50 % to 250 % by 2050

Transition to clean energy in ports
The global context

Until now, total port GHG emissions is not yet accounted for

Port emissions < shipping & land transport in port areas

Shipping GHG emissions increases as sea trade increases. Port GHG emissions increase too due to greater demand for port services.

Transition to clean energy in ports
The global context

Climate change mitigation regulations, whether national, regional or international, apply to ports.

Role of ports in the reduction of GHG emissions is essential to achieve the Paris Agreement target of limiting the global temp. rise to between 1.5^0 C to 2^0 C

Transition to clean energy in ports
The global context

To achieve the Paris Agreement target, all sectors including maritime transport need to decarbonize.

This fortifies port image and contributes to many attributes

Improve Green Reputation

Strengthen corporate social responsibility

Enhances trusts in ports

Transition to clean energy in ports
The global context

GHG emissions and energy efficiency measures are recognized as one of the pillars for planning & achieving the notable concepts of Green Ports

Ports green and sustainable pathways, specifically climate change mitigation, promote the environmental dimension of the UN SDG Goals:-

- Goal 7 [access to renewable energy]
- Goal 12 [sustainable consumption and production]
- Goal 13 [actions to mitigate climate change]
- Goal 17 [strengthen means of implementation and revitalize the global partnership for sustainable development]

Key drivers for transition to clean energy at Port Louis Harbour

Main driver behind the clean energy transition was the need to **reduce reliance on expensive fuel oil & overcome economic crisis.**

To that goal must now be added the **reduction of CO_2 emissions** from power generation.

GHG emissions produced by human activities are driving **climate change**.

Decarbonization of the power sector using renewable energy is a key requirement in the fight against climate change. Global power, still reliant on **fossil fuels**, is the largest emitter of carbon dioxide.

Key drivers for transition to clean energy at Port Louis Harbour

Decarbonization of Power System

National Level

- Government has furthered its energy transition ambition by increasing the target of renewables in the electricity mix to **60% by 2030** with the current share standing at **24% in 2022**.

Role of Utility Provider (CEB)

- Improvement of grid absorption capacity to accept intermittent RE
  - automatic generation control software
  - advanced distribution systems
  - advanced metering infrastructure
  - battery energy storage
  - modernization of substations with GIS

Framework for energy sector in Mauritius

Institutional and regulatory framework as well as policy documents applicable with reference to the energy sector in Mauritius

- Energy efficiency Act 2011
- Utility Regulatory Act 2021
- Mauritius Renewable Energy Agency Act 2015
- Electricity Act and Central Electricity Board Act
- Long Term Energy Strategy and Action Plan
- Roadmap 2030 for the Electricity Sector 2o22
- 10 Year Electric Vehicle Integration Roadmap for Mauritius
- Nationally Determined Contribution (NDC, 2021)

Transition to a clean energy at Port Louis Harbour – a stepwise approach

Step 1

Energy Efficiency (EE) as a valuable means to address to these challenges

- **It improves the country's security of supply by reducing energy consumption and decreasing energy imports.**
- **In doing so, it helps to cut the GHG emissions and in a cost-effective manner and thereby to mitigate climate change**

Transition to a clean energy at Port Louis Harbour – a stepwise approach

Step 2

Exploring the potential of Renewable Energy (RE) as an alternative means of clean energy

- **Coal has been an important source of energy in the energy mix**
- **It contributes to around 1300 GWh annually**
- **Represents 40% of electricity in the energy mix.**
- **Strategic objective of phasing out of coal by local available resources**
- **Being a SIDS with limited resources, Mauritius depends on the importation of fossil fuel, namely coal and oil to meet its energy demand.**

Transition to a clean energy at Port Louis Harbour – a stepwise approach

Step 3

GHG Emissions Sources

Defining the Scope

- The Mauritius Ports Authority (MPA) is a landlord Port Authority to regulate and control the Port Sector in Mauritius, in terms of providing main port infrastructure and superstructure together with related facilities.
- It also regulates and controls all port activities and environmental issues within the designated ports areas. The port operates round the clock throughout the year.
- MPA has authority over about **300 ha of land**.

Transition to a clean energy at Port Louis Harbour – a stepwise approach

Step 3

[Continued]

GHG Emissions Sources

Defining the Scope

- From an energy consumption perspective, the port can be divided into 4 areas, named Area 1 through to Area 4, respectively.

- Area 1 is under the complete control of MPA
- Area 2 is under the control and responsibility of the Cargo Handling Corporation. The main zone of Area 2 is the Mauritius Container Terminal (MCT).
- Area 3 relates to the zone occupied by ships. Although ships are not under the control of MPA, they consume a significant amount of energy and thus emit GHGs.
- Area 4 are under the responsibility of 55 private operators, making access to energy-related data and parameters difficult

Transition to a clean energy at Port Louis Harbour – a stepwise approach

Step 4

GHG Emissions Sources

Defining the Scope - Priorities and the Emissions Reduction Strategies (ERS) for each Area

- **Area 1**
- **MPA facilities, air conditioning & lighting systems in buildings, street lighting, Oil Jetty, fleet of tugs, transport vehicles, etc.**
- **Area 2**
- **MCT facilities , Ship-to-Shore Cranes, RTG Cranes, Yard Tactor Trailers, FLT, RS, Reefer Stations, Terminal Lighting, etc.**
- **Area 3**
- **Although ships are not under the control of MPA, they consume a significant amount of energy and thus emit GHGs.**

Transition to a clean energy at Port Louis Harbour – a stepwise approach

Step 5

Development of an ERS Plan that contained the measures that went beyond the regulatory requirements i.e., emissions controls for each Scope

- **Building Support**
- Commitment from management of MPA was critical to ensure that the ERS was successful
- **Determination of pollutants to be reduced**
- Since the Port is located near the city with populated areas, the focus of the ERS at Port Louis Harbour was on all port-related pollutants.
- **Assessment of energy/pollution reduction potential**
- **Adoption of best practices of other ports**
- **Identification of emissions control measures**

Transition to a clean energy at Port Louis Harbour – a stepwise approach

Step 6

Development of the Terms of Reference (ToR) for the appointment of a Consulting Firm for undertaking the tasks:-

Tasks under ToR

- to conduct an **Energy Audit** of each site/facility and projects in the pipeline
- to elaborate an **Strategic Energy Management Plan** which includes an action plan, comprising the short term, medium term and long-term costs and benefits associated with the introduction of each of the **Energy Efficiency (EE)** measures, technologies and practices
- to determine the pollutants to be reduced
- to assess the **Renewable Energy(RE)** potential

Transition to a clean energy at Port Louis Harbour – Results

Greenport Initiatives started in 2013 at Port Louis Harbour . EU Technical Cooperation Facility funded the study titled "Port Energy Efficiency and Renewable Energy Strategic Planning". Consulting Firm was appointed through international tendering process.

3 deliverables from the study

- An Energy Audit Report
- An Energy Efficiency Management Plan Report
- A Renewable Energy Potential Assessment Report - Beside the energy audit and energy management plan, the assessment of the renewable energy potential to supply the port facilities, allowed MPA to move towards the Green Port concept.

Efforts on sustainability have been pursued since then

Transition to a clean energy at Port Louis Harbour – Key Outcomes of EE & RE Study

Most deployed technologies in ports

Solar PV

Wind

Electric/Hybrid Vehicle

Hybrid/Electric CHE

OPS

RE/LED Lighting

Greenport Initiatives at Port Louis Harbour

Greening of Port operations

- **Solar PV installation at the Oil Jetty**
- **Mauritius Container Terminal – energy management opportunities (terminal lighting, improvement in control of the operation, electric RTGs, electric vehicles, etc.) are being explored)**
- **Shore power supply for Cruise Terminal**

Initiatives improve the image of Mauritius as a green destination

Shipping lines wish to improve their image too – they look for ports who have green policies

Case Study

The Project	• Feasibility Study for a Shore Power Supply System for Cruise ships at Port Louis Harbour • Partners Involved (Indian Ocean Commission, World Bank, Central Electricity Board)
The objective	• Reduction of emissions by ships while berthed
How to go about?	• Power connection to Central Electricity Board (CEB) power grid • Local renewable power generation > Power delivered by the Shore Power
The Investment	• USD 11. 5 M
Annual reduction in CO2 emissions	• Approximately 3, 000 tons
Impact of Project	• Could be the determining factor for a cruise line decision for homeporting in Mauritius or elsewhere

Environmental Factors

CO2 emissions

- Ships generators typically produce 675 Kg per MWh of electricity
- 2019 CEB power grid produced 1027 Kg per MWh of electricity
- 2025 CEB emissions planned to be 667 Kg per MWh of electricity
- 2030 CEB emissions planned to be 320 Kg per MWh of electricity

If MPA installs sufficient solar panels to produce the total electricity required by the cruise berth each year, CO2 emissions effectively become zero. Investment: USD 3.5 M

CEB emissions of other greenhouse gases and particulates are not known.

Noise from ship's generators is not a significant problem at this location.

Shore Power from Renewable Solar PV

Install Solar PV panels on rooftops in the port buildings, sheds, etc.

Total generation > Total Shore Power Demand

- OPS is carbon emission free

Annual energy demand ~ 4200 MWh/year

Required solar capacity ~ 2.7 MW_p

Number of solar panels ~ 5400 panels

Required rooftop space ~ 27000 m^2

Solar PV Installations at Oil Jetty
Port Louis Harbour, Mauritius

Current Solar PV under development

- Will meet **21%** of shore power requirement and reduce **866 tons of CO_2**

Challenges and Opportunities

Challenges	Opportunities
• Policy focus on economic indicators rather than environmental indicators • Financial impediments have resulted in postponement of short-term and long-term efforts to enhance port environmental sustainability • Training & awareness prior to embarking on green port technologies • Competitions from fossil fuels	• Renewable energy is being regarded as a new economic growth pole. • Improve human health and the environment by decreasing air pollution and support jobs and economic development

Questions?