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MTCC AFRICA
Maritime Technology Cooperation Centre

**MARITIME TECHNOLOGY COOPERATION CENTRE FOR AFRICA
(MTCC-Africa)**

**CAPACITY BUILDING FOR CLIMATE MITIGATION IN THE MARITIME SHIPPING
INDUSTRY**

THE GLOBAL MTCC NETWORK (GMN) PROJECT

**2019 REPORT ON
MARITIME TECHNOLOGY NEEDS ASSESSMENT
FOR
AFRICAN COUNTRIES COLLABORATING WITH MTCC-AFRICA**



This project is financed by the European Union and implemented by the International Maritime Organization



HOST OF
MTCC AFRICA

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LIST OF ACRONYMS

DWT	-	Dead Weight Tonnage
EE	-	Energy Efficiency
IMO	-	International Maritime Organization
JKUAT	-	Jomo Kenyatta University of Agriculture and Technology
KMA	-	Kenya Maritime Authority
KMD	-	Kenya Meteorological Department
KPA	-	Kenya Ports Authority
MARPOL	-	Marine Pollution
MTNA	-	Maritime Technology Needs Assessment
OPS	-	Onshore Power Supply
PMAESA	-	Port Management Association of East and Southern Africa
TEUs	-	Twenty feet Equivalent Units
RTG	-	Rubber Tired Gantry

A. INTRODUCTION

The MTCC-Africa is an EU funded project titled “Capacity Building for Climate Mitigation in the Maritime Shipping Industry” under which JKUAT is the Host institution. It is one of the five MTCCs being funded by the European Union. The project is implemented by the International Maritime Organization (IMO) under the Global MTCC’s Network.

JKUAT Mombasa CBD hosts MTCC Africa and moves towards the implementation of MTCC Africa activities.

MTCC Africa has implemented two pilot projects namely;

1. Pilot Project 1 - Pilot Project on Uptake of Ship Energy Efficient Technologies and Operations (Energy Audits at Selected Ports)
2. Pilot Project 2 – Fuel Consumption Automated Data Collection and Reporting.

In addition to the pilot projects, MTCC Africa is also undertaking a number of capacity building activities in the African region. This is to sensitize and help African countries achieve the requirements laid out in MARPOL ANNEX VI in a bid to mitigate climate change in the maritime shipping industry.

1. STAKEHOLDERS AND PARTICIPATING COUNTRIES

1.1 Stakeholders

MTCC Africa has been working closely with several stakeholders. Below are some of the stakeholders who have been actively involved in MTCC Africa activities;

- a) State Department for Maritime and Shipping Affairs, Ministry of Transport, Infrastructure, Housing and Urban Development, Kenya
 - The State Department for Maritime and Shipping Affairs has been key in linking the Host Institution and the Regional stakeholders and partners in the international maritime sphere. This ministry has also been key in facilitating national conferences on GHG emissions and Energy Efficiency in the maritime industry. In addition to this, the ministry has been engaged in promoting the publicity of MTCC Africa in their forums.
- b) Kenya Port Authority
 - Kenya Ports Authority (K.P.A) is a stakeholder to MTCC Africa by acting as a strategic partner in the 2 pilot projects. Further to this, KPA has also engaged one of their employees who is an Energy Efficiency Expert to MTCC Africa. This Energy Efficiency Expert serves on a part-time basis and provides technical and expert advice on the project activities pertaining to energy efficiency in ships and at ports;
- c) Kenya Maritime Authority
 - The Kenya Maritime Authority (K.M.A) is the link to regional maritime administrations in Africa. The Authority is also mandated to ensure that Conventions from the International Maritime Organisation are domesticated into Law. Thus, KMA is a strategic partner. Further to this, the GHG team leader who serves on a part-time basis provides technical and expert advice on the project activities pertaining the Pilot Project 2.
- d) International Lines

e) Kenya Meteorological Department

- The objective of having the Kenya Meteorological Department as a stakeholder is to establish the baseline air quality in the ports before the implementation of the MTCC Africa pilot project and assess the impacts (change) after the implementation of the pilot projects. The air quality monitoring data will be used in evaluating effectiveness of measures adopted by the ports authority in reducing energy consumption within the port. The data will also be used to advise technologies adopted to by the port authority in reducing carbon emissions within the port which form part of the objective of the pilot project on port energy audit.

B. SURVEY METHODOLOGY

Countries collaborating with MTCC Africa agreed to carry out a Maritime Technology Needs Assessment (MTNA). The survey was done in order to clearly understand the technological needs, capacity building needs and barriers/gaps that exist in the implementation of MARPOL Annex VI (technological needs involves future technics that can be used to mitigate greenhouse gas emissions i.e. exhaust gas cleaning technology and just in time methodology) in the countries. This was done by designing questionnaires addressing specific areas of interest to MTCC-Africa. (Survey questionnaire is attached in Annex). These areas included:

1. Technological needs of the participating countries.
2. Technology barriers and gaps that exist.
3. Available technologies.

The questionnaires were sent out to 18 African countries in 2018. Out of all the questionnaires sent, ten (10) countries reverted their filled questionnaires. The results of the survey will help to ascertain the status of African ports. Sample questionnaire available under the Annex.

2. Participating Countries

10 Sample countries participated in the Maritime Technology Needs Assessment exercise:

C. SURVEY

3. Country Profiles Based on responses

3.1 Number of Ports per Country

3.2 Ports and Port Facilities

3.2.1 Country A

Had 3 ports – that facilitated international trade within the country. The ports mainly handle general cargo, bulk dry cargo, bulk liquid cargo and containerized cargo. No information was given on the percentage contribution of maritime activities to the National GDP.

1. Environmental challenges affecting Country A ports are mainly:

- i. Noise pollution due to cargo handling operations
- ii. Air pollution – ship and other equipment
- iii. Land pollution due to oil, sewage pollution
- iv. Water pollution due to oil spillage, sewage etc.

These sea-ports also encounter challenges due to air pollutants related to port-ship emissions/cargo handling. These pollutants mainly come from:

- i. Cargo handling heavy duty machinery

- ii. Trucks
- iii. Ships
- iv. Heating from electricity usage

To reduce air emissions and improve energy efficiency at the ports, targets/goals have been set. These goals are strongly driven by the business/client factors as provided in the questionnaire. It was noted that energy efficiency maintenance minimizes adverse impacts to the environment.

2. Emission reduction and EE measures/technologies implemented within the ports

- i. Use of energy saving bulbs
- ii. Speed control of heavy-duty machinery/trucks
- iii. Use of marine diesel oil with low Sulphur content (Fuel Oil)
 - Challenges experienced during implementation include;
 - 1) Human behavior
 - 2) Availability of financial resources
 - 3) Lack of expertise

Of the above listed technologies/measures, it was reported that the use of energy saving bulbs and speed control are the most successful.

3. Emission reduction or EE national technology needs

The following technologies were reported necessary and required within the country

- Establishment of energy saving programmes
- EE plan
- Use of natural gas
- Use of alternative energy/solar, biogas etc.
- EEDI- Energy Efficiency Design Index
- EEOI-Energy Efficiency Operational Index

The above were described as necessary because:

- i) They will enable minimization of the impacts to the port environment
- ii) Energy saving
- iii) Protection of biological diversity
- iv) Adherence to international compliance

4. Barriers for implementing measures to reduce port-ship emissions or EE technologies.

Port-ship emission reduction/EE technologies required have not been implemented due to:

- i. Budget constraints
- ii. Lack of awareness
- iii. Lack of expertise

a) Efforts made to overcome technological barriers

- i. Stakeholder meetings conducted
- ii. Development of the national marine oil spill response contingency plan

b) Assistance required from MTCC-Africa or IMO to help overcome barriers

- a. Training- policy makers, port managers, implementers
- b. Funds

5. Awareness of IMO measures to reduce emissions from shipping & maritime industry

Country A reported to be aware of:

- I. EEDI- Energy Efficiency Design Index

II. EEOI-Energy Efficiency Operational Index

a. MARPOL Annex VI ratification

It was reported that MARPOL Annex VI has not been ratified but the process is ongoing.

b. National Legislation in place

There exists a National Environmental Management Act; it is general on-air pollution and not specific on the shipping industry.

3.2.2 Country B

Had one port, which facilitates international trade in the country. The main cargo types handled with estimated volume/weight for the port are as shown below.

1. Environmental challenges experienced at the port

The experiences environmental challenges such as climate change impact (swells, cyclones), emissions from ships, oil pollution and land-based pollution through rivers that enter the port waters.

i. Air pollutants related to port-ship emissions/cargo handling that cause challenges at the port have been identified as:

- Sulphur Dioxide
- Nitrogen Dioxide
- Carbon Dioxide
- Particulate matter pollutants resulting from coal, cement.

2. Emission reduction and EE measures/technologies implemented within the port

The country has implemented emission reduction and energy efficiency measures only within its port. These measures are replacement of fluorescent lights by energy efficient LEDs and photovoltaic system project on pilot basis. It was reported that these measures have only recently been implemented and thus it is too early to measure their impact/success. Due to this response, Port Louis is part of the ports that will be evaluated for the audit based on the evaluation criteria

3. Emission reduction or EE national technology needs

The country reported that the following technologies are necessary and required within the country

- Vessel management system
- Cleaner fuels (low Sulphur)
- More efficient ships and
- Ensuring ships are fitted with exhaust gas scrubbers

Lack of shore power providing clean energy was noted as a missing/deficient technology in the implementation of port/ship related EE technologies. The reason for selection of the above technologies was stated as reduction of energy consumption and reduction of emission of air pollutants. These measures were reported to not have been implemented as a result of:

- I. Lack of technical capacity
- II. Financial implications
- III. Absence of legal framework

4. Barriers for implementing measures to reduce port-ship emissions or EE technologies

It was reported that the country faced the following barriers in implementing measures to reduce port-ship emissions or EE technologies:

- I. These measures are technically challenging
- II. High financial implications
- III. Lack of adaptable port infrastructure

a. [Efforts made to overcome technological barriers](#)

The government is coming up with incentives to finance Green Technologies and institutions like the Central Electricity Board (CEB), Renewal Energy Agency are being setup to facilitate the process

b. [Assistance required from MTCC-Africa or IMO to help overcome barriers](#)

- I. Capacity Building
- II. Provision of technical assistance
- III. Assistance in fundraising for ports in the region (especially those of the Small Island Developing States (SIDS))

5. [Awareness of IMO measures to reduce emissions from shipping & maritime industry](#)

Country B reported to be aware that IMO has revised MARPOL (Annex VI) with a target to reduce Sulphur emissions from 3.5 to 0.5% by 2020. IMO has adopted the EEDI/SEEMP to reduce the amount of CO₂ emissions from international shipping.

a. [National Legislation in place](#)

It was reported that regulations exist in the Port Act and Environmental Protection Act. Furthermore, draft regulations have been prepared for the implementation of MARPOL Annex VI.

3.2.3 Country C

Had 8 ports; which facilitate international trade. These ports mainly handled automotive, dry bulk, liquid bulk and break-bulk commodities.

Shipping was described as important to Country C's economy as more than 95% of the country's trade is reliant on shipping. It was reported that in 2013, maritime activities were contributing 13.6% to the national GDP (R55 billion Rands and is estimated to be contributing between R129 to R177 billion by 2033).

1. [Environmental challenges experienced at the port](#)

- i) In order of severity, Country C reported the below challenges:
 - I. Adverse weather conditions related to climate change
 - II. Increase in vessel sizes VS port infrastructure
 - III. Control of emissions from ships in port –MARPOL requirements
 - IV. Ballast water management for vessels and the port
 - V. Management of biodiversity and alien invasive species
 - VI. Balanced port development with national environment priorities
- ii) Air pollutants related to port-ship emissions/cargo handling that cause challenges at ports have been identified as:
 - Exhaust fumes (NO_x & SO_x) from funnels affecting cargo operators
 - Sulphur emissions from ships during maneuvering
 - Gas emissions from road haulers
 - Cargo bulk storage (stockpiles) – source of particulate matter and dust fallout
 - Chemical odors from tanks affecting port operations

It was noted that the country has set targets/goals to reduce air emissions or improve energy efficiency in its ports as per IMO MARPOL Annex VI MEPC resolution – cap the Sulphur content for fuel used in ships to 0.5% m/m by 2020.

2. Emission reduction and EE measures/technologies implementation & challenges experienced within the port and at the ship-port interface

• **Implementation**

Emission reduction and energy efficiency measures implemented include acquisition of new tugs required the tender to ensure reduction in emissions, port EE plans, Electronic/artificial noses (**ENOSE**) system installed at the container terminal for monitoring of nuisance smells affecting port operations and setup of air quality monitoring stations. Of these implemented measures, the tug built in technology was reported to be the most effective.

• **Implementation challenges: during implementation the following were encountered**

- 1) Lack of local legislation- resulting in inability to enforce MARPOL related regulations
- 2) Cost of compliance is a challenge due to the scale of the industry
- 3) Lack of expertise to conduct inspections and enforce legislation
- 4) Lack of laboratories for testing of samples and quicker turnaround times

3. Emission reduction or EE national technology needs

It was reported that the following technologies are necessary and required within the country

- Availability of compliant bunker fuels
- Hull cleaning technology

The above were listed as necessary in order to comply with MARPOL Annex VI. The Sulphur content bunker fuel is required because vessels with cleaner hulls are known to be more efficient, use less fuel and release less emissions to the environment. These measures were reported to not have been implemented as a result of:

- a. Lack of local legislation – still in formation stage, however initiatives are in place and hull cleaning technology roll out has commenced
- b. Bunker industry investigating means to comply
- c. Lack of capacity to develop and replicate technology at a low cost

4. Barriers for implementing measures to reduce port-ship emissions or EE technologies.

It was reported that the country faced the following barriers in implementing measures to reduce port-ship emissions or EE technologies.

- a. Cost of technology and implementation
- b. Limited and lack of technology supply chains
- c. Reluctance from ship owners to comply without legislation

a) Efforts made to overcome technological barriers

Country C is open to international markets meeting international standards

b) Assistance required from MTCC-Africa or IMO to help overcome barriers

- a. Capacity building (awareness, technical training), technology building and transfer
- b. Development and sharing of data collection platforms
- c. IMO is involved in terms of the GloMeep project and participation as IMO member state in MEPC meetings

5. Awareness of measures by IMO to reduce emissions from shipping & maritime industry

Country C reported to being aware of IMO MARPOL (Annex VI) – participation in the GloMeep project. The country is an active participant at the IMO MEPC sessions and is updated with IMO initiatives.

a. MARPOL Annex VI ratification

The country has ratified MARPOL Annex VI but domestication is still in progress.

b. National Legislation in place

The country has a National Environmental Management Act and a climate change bill was reported to be in development.

3.2.4 Country D

Had 2 ports, which facilitate international trade. They mainly handle fuel, copper/lead and conc., fish & fish products. Predominantly, the fishing industry is the biggest contributor to the National GDP.

Shipping was described as important to the country as its ports serve five (5) landlocked countries in the region. Maritime activities especially fishing was reported to contribute 4.5% to the national GDP.

1. Environmental challenges experienced at the port

1. In order of severity, Country D reported the below challenges:
 - i. Lack of National Oil Pollution Plan and the task team
 - ii. Compliance to MARPOL conventions by Fishing industry and old tonnage
 - iii. Waste compliance of ship repair facility
 - iv. Lack of ballast water treatment facility in the port
2. Air pollutants related to port-ship emissions/cargo handling that cause challenges in ports have been identified as;
 - NO_x & SO_x

It was noted that the country has not set any targets/goals to reduce air emissions or improve energy efficiency in its ports.

2. Emission reduction and EE measures/technologies implementation & challenges experienced within the port and at the ship-port interface

a. Implementation

Country D has made Shore power available at various ship-port interfaces for emission reduction and energy efficiency.

b. Implementation challenges encountered:

1. There exists no official agreement on the implementation; shore power was mostly introduced by fishing factories to give vessel crews enough shore leave.
2. Inadequate manpower and skills to enforce and guide the implementation of port/ship efficiency technologies in collaboration with Ministry of Environment and Tourism are far-reaching in the implementation.
3. Heavy reliance placed on Flag States for inspection of vessels and enforcement provisions. Some of these flag states are not signatories to MARPOL Annexes which further hinders implementation.

3. Emission reduction or EE national technology needs

It was reported that numerous EE and carbon reduction technologies have been identified within the shipping sector, but their overall implementation remains unknown. It is important to know the implementation in order to establish a credible baseline and evaluate progress towards low carbon shipping.

4. Barriers for implementing measures to reduce port-ship emissions or EE technologies.

The country being a developing country is not a signatory to all MARPOL Annexes, which hampers the implementation of MARPOL Annex VI. The country also has less resources to properly carry out vessel inspections in accordance with MARPOL Annex VI.

a. Efforts made to overcome technological barriers

The country reported that no efforts yet have been made to overcome technology barriers while also calling for consideration to be given to transfer knowledge to its local Maritime Authority in order to further stimulate the adoption of EE technologies.

b. Assistance required from MTCC-Africa or IMO to help overcome barriers

The country should be given timelines on when to domesticate all MARPOL Annexes in order to comply with the emphasis placed on international shipping as adopted by the IMO.

5. Awareness of IMO measures to reduce emissions from shipping & maritime industry

The country reported its awareness of the IMO's adoption of two EE measures in July 2011, which entered into force in 2013; the Energy Efficiency Design Index (EEDI) for new ships and the Ship Energy Efficiency Managements Plan (SEEMP) for all ships.

They also acknowledge recognition by IMO for further action to reduce emissions from International shipping in view of the continued expected growth of the world economy and associated transport demand.

a. MARPOL Annex VI ratification

The country has not ratified MARPOL Annex VI because in the absence of the National Maritime Bill, the Maritime Administration operates in a silo with the prime function of only ship registry and hence additional responsibilities of the Flag State are overlooked.

b. National Legislation in place

The respondent was not aware of any legislation in place relating to air pollution from the shipping industry.

3.2.5 Country E

Had 4 ports that facilitate international trade. The main cargo types handled in these ports are ore and coal with volume at 20 ones and 15.2 ton respectively. Shipping was described as important to the economy as it contributes considerably to government revenues. Shipping contributes 4.6% to 10% to the national GDP.

1. Environmental challenges experienced at the port

a. In order of severity, the country reported the below challenges:

- Domestication and implementation of legislation such as MARPOL and SOLAS
- Infrastructure improvement

b. Air pollutants related to port-ship emissions/cargo handling that cause challenges that have been identified as gas emissions from ships.

2. Emission reduction and EE measures/technologies implementation & challenges experienced within the port and at the ship-port interface

• Implementation

No measures have been implemented in the ports. No further clarification was provided.

• Plans for implementation

The country has plans to ensure ships moor in the port with the engine switched off and use harbor facilities such as green energies.

3. Emission reduction or EE national technology needs

The country noted that the missing/deficient technologies for implementation of port/ship related EE technologies included the following:

- a. Equipment for environment quality control
- b. Equipment for emission control and air pollution

Measures were reported to not have been implemented as a result of lack of investment.

4. **Barriers for implementing measures to reduce port-ship emissions or EE technologies.**
 - b. Political barriers
 - c. Lack of financial resources
 - a) **Efforts made to overcome technological barriers**
 1. Problem awareness related to emission reduction
 2. Information publicizing on ship emission impact
 3. Event promotion regarding the subject to spread the information regarding the need of emission reduction and its prevention.

b) Assistance required from MTCC-Africa or IMO to help overcome barriers

- To be chosen for pilot project related to the emission reduction

Due to this response in relation to assistance required, the country has been considered as one of the ports to be audited based on the criteria to be used in choosing the ports.

5. **Awareness of IMO measures to reduce emissions from shipping & maritime industry**

The country noted to be aware of IMO measures. No further specification was provided.

a. MARPOL Annex VI ratification

Ratification of MARPOL Annex VI is in progress.

b. National Legislation in place

It was reported that laws and regulations are in place, but no further clarification was provided.

3.2.6 Country F

Had 8 ports; ports which facilitate international trade with its main port being Port XY. The main cargo types handled in these ports are cement, rice, sugar, petrol, and clothing at 5,103,334 tons (2017). Most goods needed in the country are imported through sea shipping hence shipping has large importance in the country with an estimated 60% contribution to the National GDP.

1. **Environmental challenges experienced at the port**

i. In order of severity, the country reported the below challenges:

1. Inexistence of port facilities
2. Inexistence of national legislation implementing international conventions
3. Inexistence of accurate data related to port environment
4. Inexistence of periodic environmental assessment in ports

ii. Air pollutants related to port-ship emissions/cargo handling that cause challenges have been identified as:

1. Land based pollutants from loading and unloading cargo
2. Port-ship emission due to fuel consumption when the ship berths at port (exhausted gases)

Targets/goals to reduce air emissions/improve EE at ports have been set. These goals have been driven by need for compliance to legislation and port policies.

2. **Emission reduction and EE measures/technologies implementation & challenges experienced within the port and at the ship-port interface**

• Implementation

No measures/technologies implemented. The main reason given for lack of implementation was that MARPOL Annex VI had not been ratified.

• Plans for implementation

A plan exists to implement emission reduction in ports by joining the MTCC initiative. Once MARPOL Annex VI is ratified (process ongoing), it will lead to the adoption of national legislation implementing the measures taken to address the issues.

3. Emission reduction or EE national technology needs

- a. Port-ship emission reduction
- b. EE technologies
- c. Collection of ship emission data

The above was listed as necessary due to the country's need to reduce port-ship emissions by encouraging alternative energy sources while ships are at harbor.

Measures were reported to not have been implemented because the concept is relatively new for the country which is still familiarizing itself.

4. Barriers for implementing measures to reduce port-ship emissions or EE technologies

- a. Lack of knowledge
- b. Absence of a national regulatory framework to implement the convention
- c. Absence of a maritime pollution policy

a) Efforts made to overcome technological barriers

- SWOT analysis done to identify cheapest method to overcome barriers

b) Assistance required from MTCC-Africa or IMO to help overcome barriers

- I. Trainings; familiarize stakeholders on necessity of addressing ship air pollution
- II. Assistance in acquisition of technology to tackle ship pollution

5. Awareness of measures by IMO to reduce emissions from shipping & maritime industry

Awareness exists on data collection, energy efficiency, Sulphur cut by 2020.

a. MARPOL Annex VI ratification

Ratification of MARPOL Annex VI is in progress but not done yet.

b. National Legislation in place

The country has an article relating to air pollution from the shipping industry in its maritime code.

3.2.7 Country G

Has 4 ports; which facilitate international trade. The table below shows the main cargo types handled at the ports.

The country imports most what it consumes and exports a large quantity of raw materials as it's the 145th largest export economy in the world. Maritime activities contribute to 20% of National GDP. In 2017 the country exported \$1.02B and imported \$3.47B.

1. Environmental challenges experienced at the port

- i. In order of severity, the below challenges were reported:
 1. Waste management/disposal
 2. Occasional spillage
- ii. Air pollutants related to port-ship emissions/cargo handling that cause challenges have been identified as:
 1. Carbon Dioxide
 2. Methane
 3. Nitrous Oxide
 4. Chlorofluorocarbons

Country G has set targets/goals to reduce air emissions or improve energy efficiency in its ports mainly driven by calls from community and other interest groups.

2. Emission reduction and EE measures/technologies implementation & challenges experienced within the port and at the ship-port interface

- **Implementation**

No implementation has been done.

- **Plans for implementation**

- a. The country has developed the National Policy and Response Strategy on Climate Change which contains a section on Transport
- b. There are plans to introduce cold ironing as a policy
- c. Plan to introduce slow steaming for ships in their waters, encourage coastal shipping, usage of alternative marine power in ports, ensure availability of compliant fuel in ports and encourage inland water transportation

- **Port-ship emission reduction and EE measures/technologies required**

The following listed technologies are necessary for the country to achieve its GHG reduction commitments.

1. Cold ironing (usage of alternative marine power)
2. Speed reduction strategies for ships entering the country's waters
3. Availability of compliant fuel in ports

- **Challenges: reasons planned measures & required technologies have not been implemented**

1. Development of policy
2. Financial constraints
3. Lack of training

3. **Emission reduction or EE national technology needs (missing/deficient technologies)**

- i) Storage
- ii) Storage areas for compliant fuel
- iii) Capacity to track the speed of ships in the country's waters
- iv) Materials Alternative Marine Power (Sufficient electricity and hardware)
- v) Shore-based Mobile Cranes (for fast loading and offloading of cargoes which reduces ship time in ports and reduces the instance of the ship running its generators)

4. **Barriers for implementing measures to reduce port-ship emissions or EE technologies.**

- a. Lack of training
- b. Lack of technologies to enhance verification of information;
- c. Lack of Funding;
- d. Lack of sufficient electrical power to support scheme such as cold ironing

a) Efforts made to overcome technological barriers

- i. Drafting a National Policy and Response Strategy on Climate Change
- ii. Ongoing discussions on policy formulation
- iii. Development of proposals to source funding

b) Assistance required from MTCC-Africa or IMO to help overcome barriers

1. Workshops and trainings
 - Capacity building workshops for administrations
2. Technical training
 - Training in calculating and verifying the EEDI; Development of model courses
3. Online platform
 - Inventory of energy-efficiency technologies
 - Creation of a website with all relevant information for the target audience
 - Improved access to information and information sharing
 - Provide verified information on real-world energy efficiency improvements via a monitoring program

5. Awareness of IMO measures to reduce emissions from shipping & maritime industry.

- i) Cold Ironing (Alternative Marine Power)
- ii) Speed Reduction Strategies
- iii) Fuel efficiency measure
- iv) Promotion of Coastal and Inland waterway shipping
- v) Energy Efficiency Design Index for new ships (EEDI)
- vi) Ship Energy Efficiency Management Plan (SEEMP)
- vii) Energy Efficiency Operational Indicator (EEOI)

a. MARPOL Annex VI ratification

The country has ratified MARPOL Annex VI which is now part of the Law since any international conventions that the ratifies become self-executory according to the Law.

b. National Legislation in place

- The country has also developed a National Policy and Response Strategy on Climate Change
- The country has initiated a marine and coastal audit to assess the implementation of IMO environment related conventions and UN Environment Multilateral Environmental Agreements

3.2.8 Country H

The country has reported that 7 ports facilitate international trade. These ports handle wet and dry cargo types. No further specification of the ports was given. Shipping is important to the country as it is the medium for movement of crude oil (highest contributor to our GDP) outside the country and for importation of goods (as a consumer nation) into the country.

1. Environmental challenges experienced at the port

- i. In order of severity, the country reported the below challenges:
 1. Contamination of water (at Ports areas)
 2. Congestion of the Ports
 3. Inadequate standard infrastructures
 4. Air Pollution
- ii. Air pollutants related to port-ship emissions/cargo handling that cause challenges have been identified as:
 1. Black soot
 2. Particulate matter
 3. SO_x
 4. CO₂

Targets/goals to reduce air emissions/improve EE at ports have been set. These goals have been compliance to legislation and business/client driven.

1. Emission reduction and EE measures/technologies implementation & challenges experienced within the port and at the ship-port interface

• Implementation

- a. Survey and certification for International Air of Pollution Prevention (IAPP) through Registered Organizations (ROs)/ Classification Societies.
- b. Monitoring of fuel oil quality before bunkering in collaboration with the Department of Petroleum Resources (DPR)
- c. Approval of Ship Energy Efficiency Management Plan (SEEMP)

• Challenges during implementation

- a. Inadequate policies

- b. Inadequate awareness creation of stakeholders like bunker fuel suppliers, ship-owners etc.
 - c. Inadequate training of officers involved in regulating air emission in our waters
2. Emission reduction or EE national technology needs
- i. IMO Approved Scrubber
 - ii. Technology for reporting, recording and analyzing SO_x, CO₂, NO_x emissions
 - iii. Technology to monitor ship emission at the ports
 - iv. Technology for inspection or enforcement of bunker fuel oil carried on board vessels
 - v. Urgent need for capacity development and technology transfer

The above were listed as necessary for country H to reduce port-ship emissions as:

- i. They will be used for converting SO_x in the exhaust to a less harmful substance thereby reducing the effect on the climate
- ii. To have a standard record of bunker fuel consumption and emission from shipping in Nigerian waters
- iii. To monitor the emissions in our waters
- iv. To enforce compliance with bunker fuel SO_x, NO_x and CO₂ emissions

Measures were reported to not have been implemented because:

- i. Inadequate sensitization of ship owners and other relevant stakeholders
- ii. Inadequate policies to encourage technology transfer
- iii. Inadequate training

3. Barriers for implementing measures to reduce port-ship emissions or EE technologies.

- i) Availability of on-spec marine fuel at affordable (economical) price
- ii) Inadequate sensitization of relevant stakeholders
- iii) Inadequate training of personnel enforcing MARPOL Annex VI
- iv) Lack of requisite technologies to control and monitor emissions

a. Efforts made to overcome technological barriers

- Request for technical cooperation assistance from IMO
- Sensitization of stakeholders
- Setting up a national technical committee for a proper coordination and effective planning towards achieving the sulphur 2020 cap and other related issues on GHG emission reductions
- Undertake MRV training

b. Assistance required from MTCC-Africa or IMO to help overcome barriers

- i. Making available technologies that will help us achieve the 0.5% sulphur regime
- ii. Training of officers regulating MARPOL Annex VI in our waters
- iii. Sensitization workshop by MTCC-AFRICA or IMO for the country.
- iv. The country feels that participation in MTCC-AFRICA project or an IMO program on emission reduction will enhance its capacity on this subject.

4. Awareness of IMO measures to reduce emissions from shipping & maritime industry

Awareness exists on:

- i. Reduction of SO_x content of marine fuel to 0.5% from January 2020
- ii. Reporting of fuel oil consumption data
- iii. Implementation of SEEMP approval by Administrations
- iv. MTCC

a. MARPOL Annex VI ratification

Ratification of MARPOL Annex VI is in progress but not done yet.

b. National Legislation in place

The country reported existence of laws and regulations relating to air pollution from the shipping industry in the country but no further specification was given.

3.2.9 Country I

The country reported that 2 ports, (under construction), within the country facilitate international trade. These ports handle wet and dry cargo types. These ports mainly handle containerized cargo (approx. 1.064M tons), dry bulk (approx. 8.466M tons) Petroleum Liquid (7.49M tons). Shipping was described as important to the economy as it is estimated that over 90% of the country's import/export trade is carried by sea. Contribution of maritime activities to the National GDP is estimated at 5.4%.

1. Environmental challenges experienced at the port

- i) In order of severity, the country reported the below challenges:
 - a. Contamination of water (at Ports areas)
 - b. Greenhouse gas emissions from ships, port operations, and vehicles
 - c. Dust from clinker, soda ash and bulk cargo operations and transport
 - d. Oil spills and marine pollution from port operations, ship and dredging
 - e. Waste management
- ii) Air pollutants related to port-ship emissions/cargo handling that cause challenges have been identified as:
 - a. Carbon dioxide
 - b. Particulate matter
 - c. Nitrogen oxides
 - d. Sulphur oxides

Targets/goals to reduce air emissions/improve EE at ports have been set. These goals have been compliance to legislation and port policy driven.

2. Emission reduction and EE measures/technologies implementation & challenges experienced within the port and at the ship-port interface

- **Implementation**
 - a. Adoption of single window system that facilitates fast clearance at the port reducing ship dwell time at the port.
 - b. Use of rail transport, as opposed to trucking, has led to reduction of emissions per unit - This is based on an earlier study, Development of a Green Port Policy and Implementation Plan for the Ports Authority, in 2015 , which attributed 57% of port of GHG emission to transit trucks. Since the introduction of the Standard Gauge Railway there has been a reduction of these trucks by about 30% hence reduction of emissions. The study also estimated that switching the freight transport from road to rail will have GHG emissions reduction impact of 76,155 tCO₂e by 2023.
- **Challenges during implementation**
 - a. Lack of expertise
 - b. Lack of funds
- **Plans for implementation**
 - a. The Port intends to install onshore power supply for use by vessels calling the Port.
- **Port-ship emission reduction and EE measures/technologies required**
 - a. Cold ironing
 - b. Installation of more efficient rubber-tired gantry (RTG) cranes

3. Emission reduction or EE national technology needs

- i. On shore power supply
- ii. Installation of air emission gauges to air emissions from shipping and port operation

The above were listed as necessary to reduce port-ship emissions;

- i. For reduction of GHG emissions from shipping and port operations
- ii. Fast offloading of vessels thus reducing ship port dwell

Measures were reported to not have been implemented due to:

- i. Inadequate funding
- ii. Lack of expertise

4. **Barriers for implementing measures to reduce port-ship emissions or EE technologies**

- i. Lack of expertise
- ii. Lack of modern technologies

a. Efforts made to overcome technological barriers

- i. Capacity building programmes on energy efficiency technologies
- ii. Participation in regional workshop for implementation of MARPOL Annex VI
- iii. Development of rail network to facilitate fast clearance of cargo at the Port.

b. Assistance required from MTCC-Africa or IMO to help overcome barriers

1. Making available technologies that will help us achieve the 0.5% Sulphur regime
2. More capacity building programmes on climate change mitigation technologies
3. Allocation of funds for adoption of low emission, adaptation and mitigation technologies at the port

5. **Awareness of IMO measures to reduce emissions from shipping & maritime industry**

Awareness exists on:

- MARPOL Annex VI developed by IMO provides for prevention of air emissions from ship
- Amendment to MARPOL Annex VI to introduced 0.5% Sulphur limit to fuel carried onboard vessel for operation or combustion purpose
- Development of guidelines for consistent implementation of 0.5% Sulphur limit under MARPOL Annex VI
- Project on capacity building for climate change mitigation and adaptation in the shipping industry.
- Technical assistance for implementation of MARPOL Annex VI

a. MARPOL Annex VI ratification

The country has ratified MARPOL Annex VI. Ratified Conventions are recognized under the Country's constitution as national laws; however, no specific regulations have been developed to domesticate MARPOL Annex VI

b. National Legislation in place

It was reported that the country has no laws or regulations in place relating to air pollution.

3.2.10 Country J

Had 2 ports that facilitate international trade; The main cargo types handled in these ports are cocoa, coffee, bananas and timber. The country reported that maritime activities contributes 80% of the National GDP.

1. **Environmental challenges experienced at the port**

- i. In order of severity, the country reported the below challenges:
 - a. Waste Management
 - b. Marine Pollution
 - c. Air Pollution

- ii. Air pollutants related to port-ship emissions/cargo handling that cause challenges have been identified as:
 - a. Carbon dioxide
 - b. Carbon monoxide
 - c. Suspended particulate matter

No targets/goals to reduce air emissions/improve EE at ports have been set yet.

2. **Emission reduction and EE measures/technologies implementation & challenges experienced within the port and at the ship-port interface**

- **Implementation**

No measures/technologies have been set yet

- **Plans for implementation**

- a. Ratification of MARPOL Annex VI and domesticate the same.

- **Port-ship emission reduction and EE measures/technologies required.**

- a. Reduction of the turn-around time of ships at port
- b. Ship loading with due consideration for emissions

The above were listed as necessary for Cameroon to reduce port-ship emissions:

- i. Ships pollute less when they spend less time in port
- ii. Operations are a major source of air pollution

3. **Emission reduction or EE national technology needs**

- a. Reduction of the turn-around time of ships at port
- b. Ship loading with due consideration for emissions
- c. National laws to integrate MARPOL Annex VI

Measures were reported to not have been implemented due to;

- MARPOL Annex VI is yet to be ratified

4. **Barriers for implementing measures to reduce port-ship emissions or EE technologies.**

- 1. MARPOL ANNEX VI has not been domesticated
- 2. Poor port infrastructure
- 3. Insufficiently trained personnel

a. **Efforts made to overcome technological barriers**

- Commencement of procedures for ratification.

b. **Assistance required from MTCC-Africa or IMO to help overcome barriers**

- 1. Capacity Building
- 2. Technological assistance
- 3. Financial assistance

5. **Awareness of IMO measures to reduce emissions from shipping & maritime industry**

Awareness exists on:

- Reduction of ship time spent in ports
- Provision of cleaner fuels to ships
- Provision of shore power connection to ships
- Environmentally oriented incentives

a. **MARPOL Annex VI ratification**

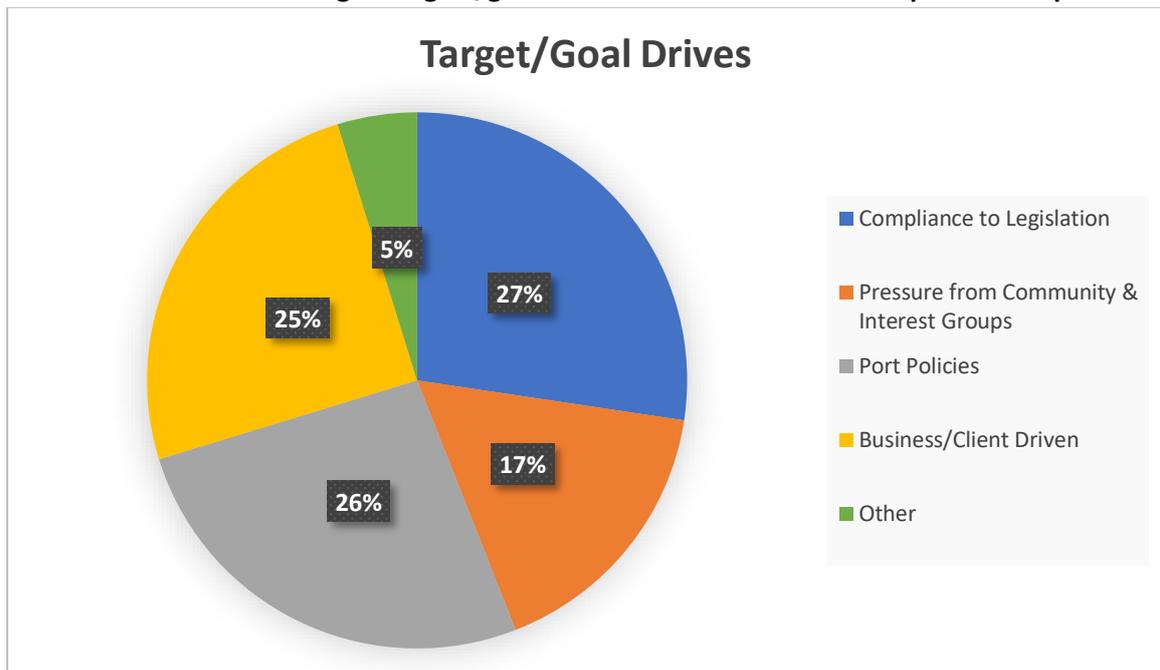
The country has not ratified MARPOL Annex VI

b. **National Legislation in place**

It was reported reported that the country has no laws or regulations in place relating to air pollution.

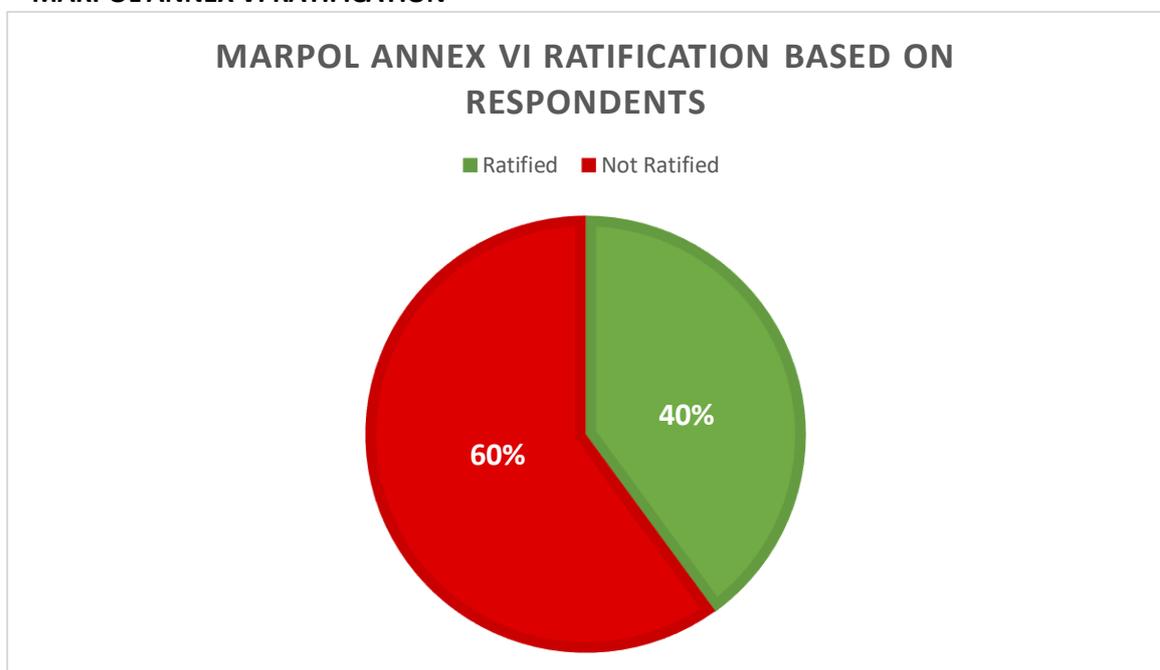
D. TRENDS BETWEEN THE AFRICAN NATIONAL PORTS

I. Reasons that drive setting of targets/goals to reduce air emissions or improve EE at ports



Countries reported that setting targets to reduce air emissions/ improve EE at ports were mainly compliance to legislation driven (27.38%), port policy driven (26.19%), business/client driven (25%), pressure from community driven (16.67%) and other reasons (4.76%).

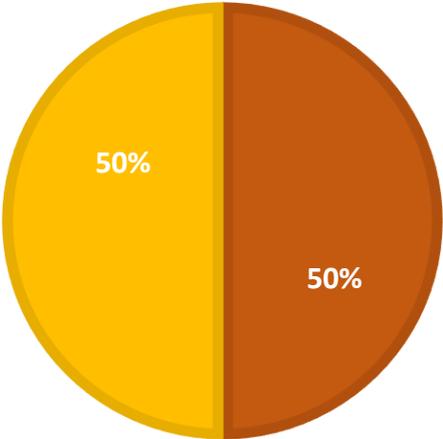
II. MARPOL ANNEX VI RATIFICATION



III. MARPOL ANNEX VI DOMESTICATION

MARPOL ANNEX VI DOMESTICATION BASED ON RESPONDENTS

■ Domesticated ■ Not Domesticated



50% of the respondent countries (2/4 countries) that have ratified MARPOL ANNEX VI have also domesticated the convention.

IV. AVAILABLE TECHNOLOGIES IN RESPONDENT COUNTRIES

COUNTRIES THAT HAVE IMPLEMENTED EMISSION REDUCTION OR ENERGY EFFICIENCY TECHNOLOGIES VS THOSE THAT HAVE NOT

■ Not Implemented ■ Implemented

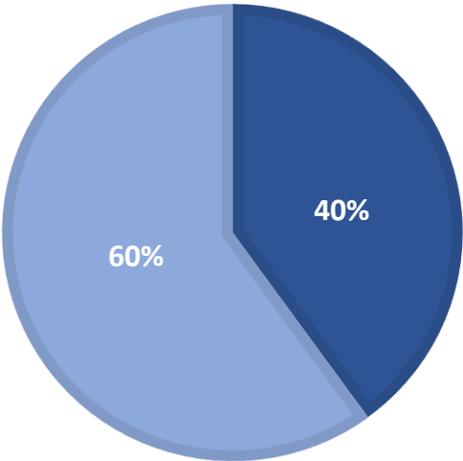
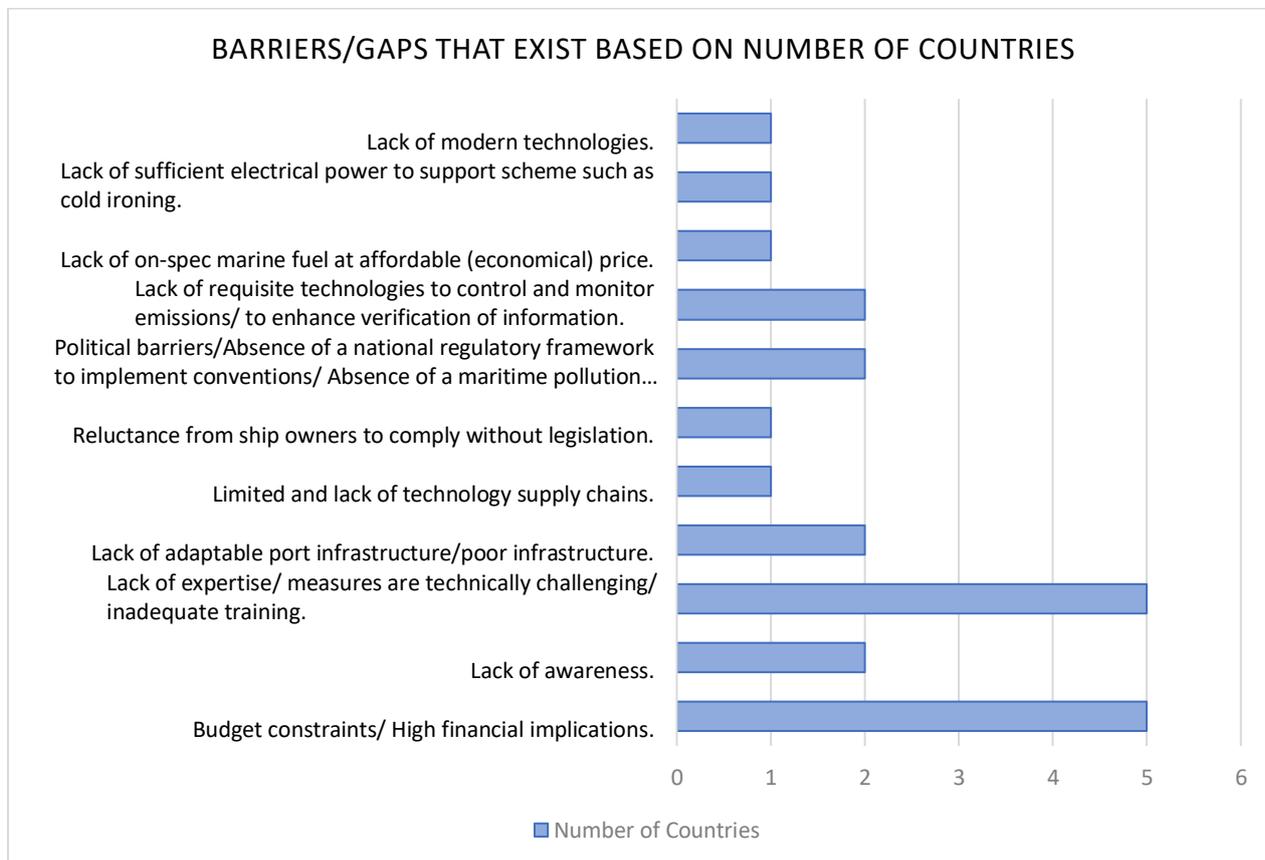


Table 1: Available Technologies in Respondent countries

V. BARRIERS & GAPS REPORTED BY RESPONDENT COUNTRIES



Barriers & Gaps reported by respondent countries
Budget constraints/ High financial implications
Lack of awareness
Lack of expertise/ measures are technically challenging/ inadequate training
Lack of adaptable port infrastructure/poor infrastructure
Limited and lack of technology supply chains
Reluctance from ship owners to comply without legislation
Political barriers/Absence of a national regulatory framework to implement conventions/ Absence of a maritime pollution policy
Lack of requisite technologies to control and monitor emissions/ to enhance verification of information
Lack of on-spec marine fuel at affordable (economical) price
Lack of sufficient electrical power to support scheme such as cold ironing
Lack of modern technologies

Table 2: Barriers & Gaps reported by respondent countries

E. CONCLUSION AND RECOMENDATIONS

The survey on national needs assessment noted that the respondents were keen on reducing their GHG emissions at their respective national ports. In order to achieve this, it was noted that assistance in the form of capacity building i.e. continuous technical trainings/model courses by MTCC Africa on the methods that encourage reduction of GHG emissions would be required. These workshops will be tailored for stakeholders in the shipping industry. It would therefore be necessary to conduct region specific capacity building activities to equip countries with the relevant and necessary information/expertise to overcome technological barriers highlighted in this survey. In addition to this, a data/information sharing platform ought to be created to aid in information sharing and technical cooperation within the greater African region.

It was also noted that a major barrier in implementing energy efficiency and emission reduction technologies in the region is a lack of financial resources. It is therefore recommended that MTCC Africa develop a region-specific fundraising strategy to aid generate necessary financial resource capital that is required in the acquisition and implementation of these technologies. The said technologies will in turn boost the countries to implement policies that reduce GHG emissions.

This maritime national needs assessment report notes that most African ports have not yet fully embraced onshore power supply/cold ironing. In this regard, MTCC Africa will need to encourage the adoption of this technology by providing technical assistance and conduct workshops on the same.

On a more concise note the following was noted as overarching issues.

Available Technologies

It was noted that the African region is wanting in the implementation of current available technologies. These technologies include for example the 'exhaust gas cleaning technology' and 'just in time operation at the ports'. There is also a lack of tier one or even attempted port energy audits conducted. This shows that the current technologies that are in operation are not sufficient in ensuring that there are limited or no emissions of greenhouse gases into the maritime and shipping industry. Given the operational nature of the African continent, it is recommended that there is a greater awareness of the MARPOL Annex VI regulation. This in turn will lead to a paradigm shift towards embracing technologies and operations that ultimately result in the reducing of greenhouse gas emissions.

Technological Needs of The Participating Countries

As highlighted in the above (available technologies) there is a need for the government administration to be well trained of better green port handling procedure. In this regard, there is need to have capacity building activities feature more in the region.

MTCC Africa is in the process of having a turnaround regional outreach strategy that will solely focus on ensuring that technological needs of the countries are met i.e. this will involve having onboard a regional industry alliance, where the private shipping and maritime sector show case available solutions and how regulation can be conducted.

Barriers and gaps that exist

It was noted that most barriers emanated around lack of capacity building initiatives, non-ratification of the Convention Marpol Annex VI and financial constraints.

It is recommended that maritime administrations set out a clear budget in the coming year for Marpol Annex VI, inhouse capacity building activities in the form of taskforce or working groups. With the forethought of handing the regional industry alliance in check, this will further assist in reducing/eliminating the barriers and gaps that exist.

F. ANNEX

1. Sample Questionnaire



Maritime Technology Cooperation Centre - Africa

Jomo Kenyatta University of Agriculture and Technology (Mombasa Campus)
P. O. Box 81310 - 80100 Mombasa – KENYA | +254 41 2315434 / +254 735 628 272
Email: mtccafrica@jkuat.ac.ke ; | Website: <http://mtccafrica.jkuat.ac.ke/>

A SURVEY FOR THE NATIONAL MARITIME TECHNOLOGICAL NEEDS AND BARRIERS BY AFRICAN PORT STATES COLLABORATING WITH MTCC-AFRICA

(Please kindly fill the questionnaire below and email it back)

NAME	
COUNTRY	
INSTITUTION	
DESIGNATION	
DATE	

1. General questions

a) How many ports in your country facilitate international trade?

.....

b) What are the main cargo types handled in your ports? (List with estimated volume/weight).

.....

c) In your opinion is shipping important to your country's economy? Explain

.....

d) Estimate the percentage contribution of maritime activities to the national GDP and explain this percentage.

.....

2. What are the environmental challenges experienced in your ports? (list in order of severity)

i.

- ii.
- iii.
- iv.

3. Are there any air pollutants related to port-ship emissions/cargo handling considered as a challenge at the sea ports? If yes list the main pollutants.

- i.
- ii.
- iii.
- iv.

4. Have you set targets/goals to reduce air emissions or improve energy efficiency at your ports? YES/NO

If YES what has driven you to set the targets to reduce air emissions or improve energy efficiency at your ports? (scale of 1-5)

		1	2	3	4	5
Compliance to legislation						
Pressure from community and other interest groups						
Port policies						
Business/client driven						
Others (specify)						

5. Have you implemented any emission reduction or energy efficiency measures/technologies within the port and at the ship-port interface? (YES/NO)

a) If YES, please list them.

-
-
-
-

i) Among the listed implemented measures/technologies, which are the most successful measures/technologies. Please explain.

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ii) What are the challenges experienced during the implementation if any?

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b) If NO, (question 5 above), are there any plans to implement any emission reduction or energy efficiency measures/technologies. Please elaborate.

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.....
.....
.....

6. In your opinion, are there port-ship emission reduction or energy efficiency technologies required in your country? Please list them.

- i.
- ii.
- iii.
- iv.

a) Please explain why the above listed technologies are necessary?

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.....
.....
.....

b) What could be the reasons why they have not been implemented as yet? (linked to no. 7)

.....
.....
.....

.....

7. What technologies are missing/deficient in your country in the implementation of Port/ ship related energy efficiency technologies

- i.
- ii.
- iii.
- iv.

8. What are the main barriers for implementing measures to reduce port-ship emissions or energy efficiency technologies? Please list them in order of priority from the most important to the least important barriers from your experience.

- i.
- ii.
- iii.
- iv.

a) What efforts have been undertaken in your country to overcome the technological barriers?

- i.
- ii.
- iii.
- iv.

b) What assistance do you require from MTCC-AFRICA or IMO to help overcome these barriers?

.....
.....
.....
.....

9. Are you aware of measures being undertaken by IMO to reduce emissions from shipping and maritime industry? Please name them.

.....
.....
.....
.....

a) Has your country ratified MARPOL Annex VI? (Yes/No)

If No, why?

.....
.....
.....
.....

If Yes, has your country domesticated MARPOL annex VI

.....
.....
.....
.....

b) Does your country have laws and regulations relating to air pollution from the shipping industry?

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.....
.....
.....

10. Any other input that may be relevant to this survey on energy efficiency and low-carbon technologies?

.....
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.....

THANK YOU FOR YOUR TIME