MTCC LATIN AMERICA
Maritime Technology Cooperation Centre

MARITIME TECHNOLOGY
COOPERATION CENTRE
FOR LATIN AMERICA

Uptake of Ship Energy Efficient Technologies and Operations

(Barriers and Constraints Examination)

GMN | The Global MTCC Network
A global network for energy-efficient shipping

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MTCC LATIN AMERICA
Maritime Technology Cooperation Centre

Capacity Building for Climate Mitigation in the Shipping Industry

Pilot Project 1
"Uptake of Ship Energy Efficient Technologies and Operations"

(Barriers and Constraints Examination)

Maritime Technology Cooperation Center- Latin America

(MTCC-Latin America)

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The views and conclusions drawn in this technical study
are those of the authors of the technical study.

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This technical study on ships energy efficient technologies and operations to examine barriers and constraints faced by regional ship owners and operators was prepared by MTCC Latin America (under its Pilot Project 1) with the participation of the individuals listed below:

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Autoridad Portuaria de Guayaquil (Port Authority of Guayaquil)
Association of Private Port Operators of Ecuador (ASOTEP)
National Tanker Fleet Association of Ecuador (FLOPEC)
Chamber of Shipping of Ecuador (CAMAE)
Hydrocarbons Regulatory Agency (ARCH)
University of the Pacific
Ministry of Environment (Division of Marine and Coastal Management)
PETROECUADOR
Naviera Marnizam

Panama

Panama Maritime Authority (PMA)
Ministry of Environment
National Secretariat of Energy
Carnival Cruise Lines
Transgas Shipping Lines SAC
Lloyds Register of Shipping (LR)
International Maritime University of Panama

Honduras

Dirección General de Marina Mercante (Merchant Marine General Directorate)
CESCO del Ministerio de Ambiente (Ministry of Environment)
Empresa Nacional Portuaria
Municipalidad de Puerto Cortés
Roatan Shipyards
Port of Roatan
Roatan Cruise Terminal
Operadora Portuaria Centroamericana (OPC)
Bay Island Petroleum
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Escuela de la Marina Mercante (ESMENA)
Universidad del Pacífico
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OCEANBAT
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Cámara Mexicana de la Industria del Transporte Marítimo (CAMEINTRAM)
Marítima & Transporte Honduras (MATRA)
INBS
CHEVRON

Peru
Dirección General de Capitanías y Guardacostas (DICAPI)
Astilleros Servicios Industriales de la Marina (SIMA)
Asociación de Armadores del Perú
Ministerio de Relaciones Exteriores (Ministry of Foreign Affairs)
Ministerio de Transporte y Comunicación
Ministerio de Energía y Minas (MINEM)
Escuela Nacional de Marina Mercante (ENAMM)
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Ministerio de Minas y Energía
Ministerio de Ambiente y Desarrollo Sostenible
Avante Escuela de Marina Mercante
Ecopetrol
Universidad Tecnológica de Bolivar

List of abbreviations

ARCH	Hydrocarbons Regulatory Agency (Ecuador)
ASOTEP	Association of Private Port Operators of Ecuador
ASTINAVE	Ecuador Naval Shipyards
CAMAE	Chamber of Shipping of Ecuador
DICAPI	Dirección General de Capitanías y Guardacostas (Peru)
DIMAR	Dirección General Marítima (Colombia)
DIRNEA	Maritime Authority of Ecuador
EEDI	Energy Efficiency Design Index
EU	European Union
EU MRV	EU Monitoring, Reporting and Verification of CO2 emissions
FLOPEC	National Tanker Fleet Association of Ecuador
GloMEEP	Global Maritime Energy Efficiency Partnerships
GMN	Global Maritime Technology Cooperation Centres Network
IMO	International Maritime Organization
IMO DCS	IMO Data Collection System
MEPC	Marine Environment Protection Committee
MIDENA	Ministry of Defense (Ecuador)
MTCC	Maritime Technology Cooperation Centre
PMA	Panama Maritime Authority

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EXECUTIVE SUMMARY

PILOT PROJECT 1 – "Uptake of Ships Energy Efficiency Technologies and Operations"

The MTCC Latin America Pilot Project 1 "Uptake of Ship Energy Efficient Technologies and Operations", aims at utilizing the existing IMO regulation on ship energy efficient technologies and operations as a starting point, for examining the barriers and constraints faced by regional ship owners and operators when implementing or planning to implement such provisions and moving towards low carbon shipping.

The project's general objective is strengthening the uptake of ship energy efficient technologies and operations by better understanding the barriers and constraints experienced by relevant stakeholders in the Latin American region, by making recommendations to policy-makers and competent administrations on actions to overcome these issues, and by disseminating the outcomes of this pilot project.

The methodology followed for the development of this pilot project, was carefully designed and planned, to cover all stakeholders views and considerations as well as all aspects of the research subject, and comprises:

(1) Literature review on the nature and status of barriers and constraints;
(2) Identification of the key stakeholders acting actively in the implementation of strategies for the uptake of ships energy efficiency technologies and operations and categorization based on their actual role;
(3) Selection of six (6) Latin American countries to form part of this study, taking into account their total fleet and availability of vessels of 400GT and over that need to apply ship energy efficient provisions, and taking into account various aspects (signatory/non-signatory to MARPOL Annex VI, PSC MOU participation), in order to ensure representative results and reliable conclusions;
(4) Development of comprehensive questionnaires addressing each category of stakeholders separately, for gathering of data and information on the research subject;
(5) Application and completion of questionnaires by the key stakeholders for collection of data;
(6) Analysis of qualitative and quantitative data collected during this pilot project;
(7) Report on the findings of the project together with description of methodologies used;
(8) Preparation of dissemination material and dissemination activities of project results (throughout the project's implementation to engage stakeholders as well as after its completion).

1. Introduction

The adverse effects of man-made climate change are now more apparent than ever before in our everyday lives. This has caused tackling climate change to become a global priority.

The shipping industry has not been left behind. The relevant policy-making IMO´s Marine Environment Protection Committee (MEPC), started on 2011 with amendments by means of technical performance standards to enhance ship´s energy efficiency (EEDI and SEEMP), leading to the reduction of emissions of substances originated from fuel oil and its combustion process.[1]

Afterwards, in 2013, MEPC 65 adopted resolution MEPC.229 (65) on Promotion of Technical Co-operation and transfer of technology relating to the improvement of energy efficiency of ships leading to the strengthening of partnerships with other interested parties.

Later on January 2016, the European Union (EU) and the International Maritime Organization (IMO) reached an agreement to establish a Global Maritime Technology Cooperation Centres Network (GMN) aiming to help reduce greenhouse gas emissions by, among others, encouraging the uptake of innovative energy efficient technologies and practices.

On October 2016, MEPC 70 adopted mandatory MARPOL Annex VI requirements for ships to record and report their fuel oil consumption, by resolution MEPC.278 (70). MEPC 70 also adopted the 2016 Guidelines for the development of a Ship Energy Efficiency Management Plan (SEEMP), by resolution MEPC.282 (70). The Ship Energy Efficiency Management Plan (SEEMP) is an operational measure that establishes a mechanism to improve the energy efficiency of a ship in a cost-effective manner whilst also providing an approach for shipping companies to manage ship and fleet efficiency performance over time using, for example, the Energy Efficiency Operational Indicator (EEOI) as a monitoring tool.

In April 2018, IMO's Marine Environment Protection Committee (MEPC) adopted an initial strategy on the reduction of greenhouse gas emissions from ships, setting out a vision to reduce GHG emissions from international shipping and phase them out, as soon as possible in this century. The vision confirms IMO’s commitment to reducing GHG emissions from international shipping and, as a matter of urgency, to phasing them out as soon as possible.

Some of the methods available for energy improvements include fuel-efficient operations (improved voyage planning, just in time or speed optimization), optimized ship handling (shaft power, trim, ballast, and propeller design or

[1] IMO Resolution MEPC.203 (62), Adopted don 15 July 2011

propeller inflow), hull maintenance, improved propulsion systems, improved fleet management, improved cargo handling or energy management.

Although, these technologies and practices are available in the Latin American region, their effective adoption would be greatly enhanced by an in-depth understanding of the barriers and constraints faced by relevant stakeholders.

2. Description of the MTCC Latin America Pilot Project 1

(a) Pilot Project 1 aim

The MTCC Latin America Pilot Project 1 “Uptake of Ship Energy Efficient Technologies and Operations”, aims at utilizing the existing IMO regulation on ship energy efficient technologies and operations as a starting point, for examining the barriers and constraints faced by regional ship owners and operators when implementing or planning to implement such provisions and moving towards low carbon shipping.

(b) General objective

The general objective of Pilot Project 1 is to strengthen the uptake of ship energy efficient technologies and operations by better understanding the barriers and constraints experienced by relevant stakeholders in the Latin American region, by making recommendations to policy-makers and competent administrations on actions to overcome these issues, and by disseminating the outcomes of this pilot project.

(c) Target audience

This Pilot Project 1 has been developed taking into consideration the fundamental role of all the Stakeholders acting actively in the implementation of strategies for the uptake of ships energy efficiency technologies and operations.

The target audience for this project are all stakeholders acting actively in the implementation of strategies for the uptake of ships energy efficiency technologies and operations:

- Maritime Administrations
- Government Institutions
- Shipyards
- Maritime Training Centers/Institutes
- Ship Owners
- Ship Operators
- Ship Designers
- Marine Diesel Engine and Equipment Manufacturers
- Classification Societies / Recognized Organizations (ROs)
- Marine Fuel Suppliers
- Port Authorities / Operators
- National Policymakers
- Other interested groups and maritime professionals

This report brings the information obtained to the attention of almost 300 participants and the responsible authorities of 17 Latin American countries that have been engaged and trained through direct interaction with MTCC Latin America as well as through the regional and national workshops organized by MTCC Latin America, across the participant countries.

The Pilot Project 1 has delivered 5 capacity-building workshops across the participant countries, providing training on IMO's energy efficiency regulations, energy efficient ship operation, port state control and enforcement, as well as how to implement measures to improve efficiency on shipping, Ship Energy Efficiency Management (SEEMP Part I & Part II) and the fuel data collection methodology in accordance with MARPOL Annex VI regulations.

(d) Stakeholders participating in this project:

Six (6) Latin American countries were selected to form part of this study:

(1) Panama
(2) Peru
(3) Mexico
(4) Honduras
(5) Ecuador
(6) Colombia

The participating countries were selected based on their total fleet and availability of vessels of 400GT and over that need to apply ship energy efficient provisions, and taking into account various aspects (signatory/non-signatory to MARPOL Annex VI, PSC MOU participation), in order to ensure representative results and reliable conclusions.

The study divided the countries in two (2) groups, three (3), which already ratified MARPOL Annex IV, and three (3), which are under that process.

Panama

- Panama Maritime Authority (PMA)
- Ministry of Environment
- National Secretariat of Energy
- Carnival Cruise Lines
- Transgas Shipping Lines SAC
- International Maritime University of Panama (UMIP)
- Lloyds Register of Shipping (LR)

Honduras

- Dirección General de Marina Mercante (Merchant Marine General Directorate)
- CESCO del Ministerio de Ambiente (Ministry of Environment)
- Empresa Nacional Portuaria
- Municipalidad de Puerto Cortés
- Roatan Shipyards
- Port of Roatan
- Roatan Cruise Terminal
- Operadora Portuaria Centroamericana (OPC)
- Bay Island Petroleum
- Refinería Texaco de Honduras
- Agencia Naviera de Europa
- Agencia NAVYSA
- Marítima & Transporte Honduras (MATRA)
- INBS
- CHEVRON

Peru

- Dirección General de Capitanías y Guardacostas (DICAPI)
- Astilleros Servicios Industriales de la Marina (SIMA)
- Asociación de Armadores del Perú
- Ministerio de Relaciones Exteriores (Ministry of Foreign Affairs)
- Ministerio de Transporte y Comunicación
- Ministerio de Energía y Minas (MINEM)
- Escuela Nacional de Marina Mercante (ENAMM)
- Ministerio de Ambiente (MINAM)
- Universidad Tecnológica de Perú (UTP)
- Transgas Shipping Lines SAC
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- Dirección General Marítima (DIMAR)
- COTECMAR Shipyards
- Superintendencia de Puertos y Transporte
- Ministerio de Minas y Energía
- Ministerio de Ambiente y Desarrollo Sostenible
- Avante Escuela de Marina Mercante
- Ecopetrol
- Universidad Tecnológica de Bolivar

Ecuador

- Dirección General de los Espacios Acuáticos (DIRNEA)
- National Port Authority of the Ministry of Transportation
- Ecuador Naval Shipyards (ASTINAVE)
- Ministry of Defense (MIDENA)
- Galapagos National Park Authority
- Autoridad Portuaria de Guayaquil (Port Authority of Guayaquil)
- Association of Private Port Operators of Ecuador (ASOTEP)
- National Tanker Fleet Association of Ecuador (FLOPEC)
- Chamber of Shipping of Ecuador (CAMAE)
- Hydrocarbons Regulatory Agency (ARCH)
- University of the Pacific
- Ministry of Environment (Division of Marine and Coastal Management) PETROECUADOR
- Naviera Marnizam
- Escuela de la Marina Mercante (ESMENA)
- Universidad del Pacífico
- ECUAESTIBAS
- OCEANBAT

Mexico

- Unidad de Capitanías de Puerto y Asuntos Marítimos (UNICAPAM)
- Secretaría de Relaciones Exteriores
- Secretaría de Comunicaciones y Transporte (SCT)
- Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT)
- Secretaría de Energía (SENER-CONUEE)
- DIGECONSNAV-SEMAR
- Petróleos Mexicanos (PEMEX)
- Cámara Mexicana de la Industria del Transporte Marítimo(CAMEINTRAM)

Further to the above, the study aimed at engaging also separately all other stakeholders from the participating countries, with an aim of receiving detailed information, views and considerations, thus ensuring accurate and complete insights.

To this regard, identification of all stakeholders acting actively in the implementation of strategies for the uptake of ships energy efficiency technologies and operations, and categorization based on their actual role took place, as follows:

1. Maritime Administrations
2. Government Institutions
3. Ship Owners / Ship Operators
4. Port Authorities / Operators
5. Maritime Training Centers/Institutes
6. Marine Fuel Suppliers
7. Shipyards
8. Classification Societies / Recognized Organizations
9. National Policymakers

3. Methodology

The development of the pilot project comprises the experience gained and a literature review performed by the staff and consultants of this MTCC Centre. Particularly based on the nature and status of barriers and constraints to implement provisions of IMO Ship Energy Efficiency Regulations faced by the group of six (6) Latin American countries part of this study for implementing provisions of IMO Ship Energy Efficiency Regulations.

The pilot project had different stages of implementation, starting with a literature review on the scope of regional shipping and the nature and status of barriers and constraints in the participating countries.

The pilot project utilized relevant techniques to identify status, barriers and constraints in particular the use of survey questionnaires for collecting relevant data. The use of new and/or existing guidance such as the GloMEEP Strategy Development Guide and the Ship Emissions Toolkit (3 Guides) and Port emissions Toolkit (2 Guides) developed by GLOMEEP, were utilized where applicable.

Furthermore, to the review described above, the Centre proceeded to apply and analyze comprehensive questionnaires to stakeholders described in the target audience section for data gathering and information to uptake energy efficient technologies and operations.

It is relevant to mention that the information obtained from the questionnaires to stakeholders were used to complement the data analysis of the qualitative and quantitative information collected during this pilot project for generating the final report on the findings.

The methodology followed for the development of this pilot project, was carefully designed and planned, to cover all stakeholders views and considerations as well as all aspects of the research subject, and it is summarized as follows:

- Literature review on the nature and status of barriers and constraints;
- Identification of the key stakeholders acting actively in the implementation of strategies for the uptake of ships energy efficiency technologies and operations and categorization based on their actual role;
- Selection of six (6) Latin American countries to form part of this study, taking into account their total fleet and availability of vessels of 400GT and over

that need to apply ship energy efficient provisions, and taking into account various aspects (signatory/non-signatory to MARPOL Annex VI, PSC MOU participation), in order to ensure representative results and reliable conclusions;

- Development of comprehensive questionnaires addressing each category of stakeholders separately, for gathering of data and information on the research subject;
- Application and completion of questionnaires by the key stakeholders for collection of data;
- Analysis of qualitative and quantitative data collected during this pilot project;
- Report on the findings of the project together with description of methodologies used;
- Preparation of dissemination material and dissemination activities of project results (throughout the project's implementation to engage stakeholders as well as after its completion).

(a) Detailed breakdown of Pilot Project 1 activities:

(1) The development of the pilot project followed the experience gained and a literature review (refer to Appendix 1 of this study) performed by the staff and consultants of this MTCC Centre. Particularly based on the nature and status of barriers and constraints to implement provisions of IMO Ship Energy Efficiency Regulations faced by the Latin American countries for implementing provisions of IMO Ship Energy Efficiency Regulations.

(2) As a first step, key stakeholders acting actively in the implementation of strategies for the uptake of ships energy efficiency technologies and operations were identified:

- Maritime Administrations
- Government Institutions
- Shipyards
- Maritime Training Centers/Institutes
- Ship Owners
- Ship Operators
- Ship designers
- Marine Diesel Engine and Equipment Manufacturers
- Classification Societies / Recognized Organizations (ROs)
- Marine Fuel Suppliers
- Port Authorities / Operators
- National Policymakers

- Other interested groups and maritime professionals

The next step was to categorize the key stakeholders acting actively in the implementation of strategies for the uptake of ships energy efficiency technologies and operations based on their actual role. The following nine (9) categories were created:

1. Maritime Administrations
2. Government Institutions
3. Ship Owners / Ship Operators
4. Port Authorities / Operators
5. Maritime Training Centers/ Institutes
6. Marine Fuel Suppliers
7. Shipyards
8. Classification Societies / Recognized Organizations
9. National Policymakers

(3) The six (6) participating countries (Panama, Peru, Mexico, Honduras, Ecuador, Colombia) were selected based on their total fleet and availability of vessels of 400GT and over that need to apply ship energy efficient provisions, and taking into account various aspects (signatory/non-signatory to MARPOL Annex VI, PSC MOU participation), in order to ensure representative results and reliable conclusions.

(4) A set of questionnaires was created, each addressing a specific category of key stakeholders, with an aim of receiving detailed information, views and considerations by each category of stakeholders separately, thus ensuring accurate and complete insights.

In particular, the questionnaires were devised in a way to provide detailed insights on organization details, level of familiarization with adopted/implemented policies and regulations on both national & international level, national & international policies & regulations affecting the organization, organization's main activities and details on ships served/fleet, whether a policy on Energy Efficiency implementation in place, measures on Energy Efficiency for avoiding or reducing atmospheric pollution, preparations and considerations adopted to meet requirements, processes, and finally views and considerations on:

-Barriers / Challenges / Constraints
-Opportunities
-Recommendations
-Lessons learned

(5) Through the questionnaires, an investigation was carried out to the six (6) countries, in order to establish:

-Classification/Description of actors (Key Industry Players), involved in:
The public sphere, the private sector, country policies on climate change and energy efficiency, legal framework of Maritime Administrations and any entity with competence and jurisdiction in the subject matter, climate change provisions, environmental provisions, provisions on emission reduction in the maritime transport sector, provisions on energy efficiency in the maritime field.
Every possible effort was made, to engage stakeholders from all categories in each country.

(6) At this stage, a literary review of the six (6) countries selected was conducted to tackle the regulatory framework of Annex VI of MARPOL 73/78. The countries were divided in two (2) groups of three (3) countries each one, one group for signatories to MARPOL Annex VI and the other non-signatories to MARPOL Annex VI. The groups are shown as follows:

Signatory States to MARPOL Annex VI
(1) Panama
(2) Honduras
(3) Peru

Non-signatory States to MARPOL Annex VI
(4) Colombia
(5) Ecuador
(6) Mexico

(7) Then, the *filled in* questionnaires, were collected under a Participating Country Master File, forming the insights on all stakeholders' views and considerations for that participating country.

The data was extracted and analyzed both under a:

(i) Quantitative Analysis for establishing level of engagement and participation, and
(ii) Qualitative Analysis, per participating country and stakeholders' category, with an aim of receiving detailed information, views and considerations, thus ensuring accurate and complete insights.

(8) The detailed report on the methodology and results of Pilot Project 1 was drafted, communicating available draft results for increased dissemination effect in national workshops and direct interactions with stakeholders, to maximize interest and engagement.

(9) Dissemination material was drafted and dissemination activities of project results were ongoing, throughout the project's implementation period, to maximize interest and engagement of stakeholders.

This was achieved through continuous development and updating of the training material (Appendix 3 of this study) and other dissemination materials (Appendix 4 of this study), to reflect the outcomes, experience gained and lessons learned through the project implementation up to the specific point, and their effective dissemination through the project's dedicated website, social media as well as through interpersonal interactions and capacity building activities.

Full details and evidence on dissemination activities and the final training material, are included in Appendix 4 – Other dissemination material and Appendix 3 – Training Material, respectively.

Dissemination activities (including dissemination of the final project report) will continue to be carried out after the project's completion as well, mainly through use of the MTCC Latin America's website and social media channels, to maximize the project's impact.

4. Sources of data

The sources of data for analysis are:

(1) the detailed responses in the duly *filled in* questionnaires, as obtained by the six (6) selected Latin American countries which form part of this study, as well as,

(2) the detailed responses in the duly filled in questionnaires of the other stakeholders active in each selected participating country, including:

1. Maritime Administrations
2. Government Institutions
3. Ship Owners / Ship Operators
4. Port Authorities / Operators
5. Maritime Training Centers/Institutes
6. Marine Fuel Suppliers
7. Shipyards
8. Recognized Organizations
9. National Policymakers

(3) The detailed responses on energy efficient measures implemented onboard the vessels of companies from the participating countries.

Table 1-Selection of the six (6) participating countries in MTCC Latin America Pilot Project 1

Country	Signatory to MARPOL Annex VI	Total fleet (incl. ships under MARPOL Annex VI) *as per UNCTAD 2019 data	IMO Member State	IMO Council Member	PSC MOUs
Argentina	No		Yes	No	Acuerdo de Viña del Mar
Bolivia	No		Yes	No	Acuerdo de Viña del Mar
Brazil	Yes		Yes	Yes – Category B	Acuerdo de Viña del Mar
Chile	Yes		Yes	Yes – Category C	Acuerdo de Viña del Mar, Tokyo MOU
Colombia	No	**115 ships**	Yes	No	Acuerdo de Viña del Mar
Costa Rica	No		Yes	No	Acuerdo de Viña del Mar
Ecuador	No	**137 ships**	Yes	No	Acuerdo de Viña del Mar
El Salvador	No		Yes	No	Acuerdo de Viña del Mar
Guatemala	Yes		Yes	No	Acuerdo de Viña del Mar
Honduras	Yes	**527 ships**	Yes	No	Acuerdo de Viña del Mar
Mexico	No	**637 ships**	Yes	Yes – Category C	Acuerdo de Viña del Mar
Nicaragua	No		Yes	No	Acuerdo de Viña del Mar
Panama	Yes	**7860 ships**	Yes	Yes – Category A	Acuerdo de Viña del Mar, Tokyo MOU
Paraguay	No		Yes	No	Acuerdo de Viña del Mar
Peru	Yes	**98 ships**	Yes	Yes – Category C	Acuerdo de Viña del Mar
Uruguay	Yes		Yes	No	Acuerdo de Viña del Mar
Venezuela	No		Yes	No	Acuerdo de Viña del Mar

(a) Provision was taken to include countries that have significant fleet including ships to which MARPOL Annex VI regulations apply.

(b) Provision was taken to include countries that are both signatory or non-signatory to the MARPOL Annex VI:

-MARPOL Annex VI signatory states (3): **Panama, Peru, Honduras**

-MARPOL Annex VI non-signatory states (3): **Mexico, Ecuador, Colombia**

(c) Details on participating Countries: members and non-members of the IMO Council, and their Categories of membership:

-IMO Council Member – Category A (1): **Panama**

-IMO Council Member – Category C (2): **Mexico, Peru**

-Non IMO Council Members (3): **Ecuador, Honduras, Colombia**

(d) Provision was taken to include countries represented in both PSC MOUs to which Latin America Countries participate:

- Acuerdo Vina del Mar (6): **Panama, Peru, Honduras, Mexico, Ecuador, Colombia**

-Tokyo MOU (1): **Panama**

5. Analysis of data

Regarding the *filled in* questionnaires, the documents were collected under a Participating Country Master File, forming the insights on all stakeholders views and considerations for that participating country. The process of data collection with the use of these questionnaires started 2018 mid-year.

The data were extracted and analyzed both under a:

(i) Quantitative Analysis for establishing level of engagement and participation, and

(ii) Qualitative Analysis, per participating country and stakeholders category, with an aim of receiving detailed information, views and considerations, thus ensuring accurate and complete insights.

The data analysis results are reflected in the following tables.

(i) Quantitative Analysis

Quantitative analysis emphasized on the statistical analysis of data collected through the questionnaires, for establishing level of engagement and participation.
The pilot project 1 participation goals were exceeded, as 43 questionnaires were filled in, with the participation of a total of 64 participating persons, from 43 organizations, representing all categories of key stakeholders, as seen on tables 2 & 3.
Moreover, regarding the energy efficient measures implemented onboard ships; relevant responses were received by a total of 82 ships over 400GT.

(ii) Qualitative Analysis

Qualitative analysis took place for the analysis of text data from the filled in questionnaires and the ships responses for the energy efficient measures implemented onboard.

Quantitative and Qualitative Analysis Results are reflected at:

- Table 2 - Literature Review: Preparation of Countries details
- Table 3- Stakeholders selected for participation that filled in questionnaires (per country)
- Table 4- Summary of filled-in questionnaires, in line with the requirements of Pilot Project 1
- Table 5-Detailed description on filled-in questionnaires, in line with the requirements of Pilot Project 1 (participants)
- Table 6- Summary of data, on participating country level
- Table 7- Detailed description of filled in questionnaires, per participating country and stakeholders category
- Table 8- Summary of the questionnaires responses (per country)
- Table 9-Summary on Energy Efficient Measures implemented onboard participating ships

Table 2-Literature Review Reports for Participating Countries: Countries details

Country	Participating Country Report	Details
Panama	Prepared	*Refer to Appendix 1, to review full details for participating country*
Honduras	Prepared	*Refer to Appendix 1, to review full details for participating country*
Peru	Prepared	*Refer to Appendix 1, to review full details for participating country*
Colombia	Prepared	*Refer to Appendix 1, to review full details for participating country*
Ecuador	Prepared	*Refer to Appendix 1, to review full details for participating country*
Mexico	Prepared	*Refer to Appendix 1, to review full details for participating country*

Table 3-Stakeholders selected for participation that filled in questionnaires (per country)

Colombia	
Organization	**Stakeholder Category**
COTECMAR	Shipyards / Dry-docks
ECOPETROL	Marine Fuel Suppliers
MINISTRY OF MINES & ENERGY	Government Institutions
MINISTRY OF ENVIRONMENT & SUSTAINABLE DEVELOPMENT	Government Institutions
UNIVERSIDAD TECNOLOGICA DE BOLIVAR	Maritime Training Centres/Institutes
DIMAR	Maritime Administrations
SUPERINTENDENCE OF PORTS	Port Authorities / Operators
AVANTE-ESCUELA DE MARINA MERCANTE	Maritime Training Centres/Institutes

Ecuador	
Organization	**Stakeholder Category**
DIRECCION NACIONAL DE LOS ESPACIOS ACUATICOS (DIRNEA)	Maritime Administrations
ASTILLEROS NAVALES ECUATORIANOS - ASTINAVE EP	Shipyards / Dry-docks
UNIVERSIDAD DEL PACIFICO	Maritime Training Centres/Institutes
MINISTRY OF ENVIRONMENT	Government Institutions
SUBSECRETARIA DE PUERTOS Y TRANSPORTE MARITIMO Y FLUVIAL	Government Institutions

Honduras	
Organization	**Stakeholder Category**
CHEVRON	Marine Fuel Suppliers
EMPRESA NACIONAL PORTUARIA	National Policymakers
DIRECCION GENERAL DE MARINA MERCANTE	Maritime Administrations
PORT OF ROATAN	Port Authorities / Operators
BAY ISLAND PERTOLEUM	Marine Fuel Suppliers
AGENCIA NAVIERA EUROPEA SA	Ship Owners / Operators

Mexico	
Organization	**Stakeholder Category**
DIGECONSNAV	Shipyards / Dry-docks
UNICAPAM	Maritime Administrations
CONUEE	Government Institutions
CAMARA MEXICANA DE LA INDUSTRIAL DEL TRANSPORTE MARITIMO	Ship Owners / Operators

Panama	
Organization	**Stakeholder Category**
SEGUMAR	Maritime Administrations
UMIP	Maritime Training Centres/Institutes
CARNIVAL CRUISE LINES	Ship Owners / Operators
SECRETARIA DE ENERGIA	Government Institutions
MINISTERIO DE AMBIENTE	Government Institutions
TRANSGAS	Ship Owners / Operators
LLOYDS REGISTER	Recognized Organizations (ROs)

Peru	
Organization	**Stakeholder Category**
DICAPI	Maritime Administrations
NAVITRANSO	Ship Owners / Operators
TRANSGAS	Ship Owners / Operators
MIN. DE TRANSPORTE Y COMUNICACIONES / AUTORIDAD PORTUARIA NACIONAL	Government Institutions
ASOCIACION NACIONAL DE ARMADORES	Ship Owners / Operators
MINISTERIO DE ENERGIA Y MINAS (MINEM)	Government Institutions
MINISTERIO DE RELACIONES EXTERIORES	Government Institutions
UNIVERSIDAD TECNOLOGICA DEL PERU	Maritime Training Centres/Institutes
UNIVERSIDAD MARITIMA DEL PERU	Maritime Training Centres/Institutes
MINISTERIO DE AMBIENTE (MINAM)	Government Institutions
SIMAPERU	Shipyards / Dry-docks
ESCUELA NACIONAL DE MARINA MERCANTE	Maritime Training Centres/Institutes
REPSOL	Marine Fuel Suppliers

Table 4-Summary of filled in questionnaires, in line with the requirements of Pilot Project 1

	Filled in Questionnaires per participating country						
Description of Questionnaire	**Total**	**Colombia**	**Ecuador**	**Honduras**	**Mexico**	**Panama**	**Peru**
"Shipyard" Interview Form	**4**	1	1	0	1	0	1
"Government Institutions" Interview Form	**11**	2	2	0	1	2	4
"Maritime Administrations" Interview Form	**6**	1	1	1	1	1	1
"Marine Fuel Suppliers" Interview Form	**4**	1	0	2	0	0	1
"National Policies" Interview Form	**1**	0	0	1	0	0	0
"Ports" Interview Form	**2**	1	0	1	0	0	0
"Recognized Organizations" Interview Form	**1**	0	0	0	0	1	0
"Ship Owners" Interview Form	**7**	0	0	1	1	2	3
"Training Centers" Interview Form	**7**	2	1	0	0	1	3
TOTAL:	**43**	**8**	**5**	**6**	**4**	**7**	**13**

Table 5-Detailed description of filled in questionnaires, in line with the requirements of Pilot Project 1 (participants)

No.	Organization	Country	Category	Person(s) participating in the interview	Date of Interview
1	COTECMAR	Colombia	Shipyards / Dry-docks	(2) Monica Ruiz, Adolfo Silva	23/08/2018
2	ECOPETROL	Colombia	Marine Fuel Suppliers	(1) Luiz Aristizabal	04/12/2018
3	MINISTRY OF MINES & ENERGY	Colombia	Government Institutions	(1) Sandra Salamanca	09/12/2018
4	MINISTRY OF ENVIRONMENT & SUSTAINABLE DEVELOPMENT	Colombia	Government Institutions	(2) Giovanni Pavon, Ximena Samaniego	05/12/2018
5	UNIVERSIDAD TECNOLOGICA DE BOLIVAR	Colombia	Maritime Training Centers/Institute	(1) Dr. Julio Cabrera	05/12/2018
6	DIMAR	Colombia	Maritime Administrations	(2) Leonardo Rocha, Jose Soto	05/12/2018
7	SUPERINTENDENCE OF PORTS	Colombia	Port Authorities / Operators	(1) Luis Eduardo Chavez	06/12/2018
8	AVANTE-ESCUELA DE MARINA MERCANTE	Colombia	Maritime Training Centers/Institute	(1) Capt. Jose Andres Nieto	06/12/2018
9	DIGECONSNAV	Mexico	Shipyards / Dry-docks	(2) Capt. Nav. Jose Lopez, Cap. Corb. Angel Trinidad Gonzalez	21/01/2019
10	UNICAPAM	Mexico	Maritime Administrations	(1) Miguel Nunez	31/01/2019
11	CONUEE	Mexico	Government Institutions	(1) Francisco Garcia	24/01/2019
12	CAMARA MEXICANA DE LA INDUSTRIAL DEL TRANSPORTE MARITIMO	Mexico	Ship Owners / Operators	(2) Luis Manuel Ocejo, Armando Rodriguez	28/01/2019
13	CHEVRON	Honduras	Marine Fuel Suppliers	(1) Saady Dubon	05/09/2018
14	EMPRESA NACIONAL PORTUARIA	Honduras	National Policymakers	(1) Domingo Menjivar	07/08/2018
15	DIRECCION GENERAL DE MARINA MERCANTE	Honduras	Maritime Administrations	(1) Marco Avelar	06/08/2018
16	PORT OF ROATAN	Honduras	Port Authorities / Operators	(1) Kester Bodden	06/08/2018
17	BAY ISLAND PERTOLEUM	Honduras	Marine Fuel Suppliers	(1) Kenrick Dixon	06/08/2018
18	AGENCIA NAVIERA EUROPEA SA	Honduras	Ship Owners / Operators	(1) Pamela Galindo	08/08/2018
19	DICAPI	Peru	Maritime Administrations	(8) Ing. Anthony Lopez, Fidel Reyes, Fred Espinoza, Humberto Torres, Yessica Perez, Karen Nunez Lozada, Luzangela Sanchez, Senndi Loardo Vilcahuaman	17/09/2018
20	NAVITRANSO	Peru	Ship Owners / Operators	(2) Jorge Baudouin, Luis Murghia	18/09/2018
21	TRANSGAS	Peru	Ship Owners / Operators	(2) Elmer Acuna, Gustavo Medina	18/09/2018
22	MIN. DE TRANSPORTE Y COMUNICACIONES / AUTORIDAD PORTUARIA NACIONA	Peru	Government Institutions	(1) Mauro Daniel Pelayo	19/09/2018
23	ASOCIACION NACIONAL DE ARMADORES	Peru	Ship Owners / Operators	(1) Alberto Mendiola	19/09/2018
24	MINISTERIO DE ENERGIA Y MINAS (MINEM)	Peru	Government Institutions	(1) Felix Bernabel Badillo	20/09/2018
25	MINISTERIO DE RELACIONES EXTERIORES	Peru	Government Institutions	(1) Jesus R. Ponce Bravo	20/09/2018
26	UNIVERSIDAD TECNOLOGICA DEL PERU	Peru	Maritime Training Centers/Institute	(1) Frank Pretelt	21/09/2018

No.	Organization	Country	Category	Person(s) participating in the interview	Date of Interview
27	UNIVERSIDAD MARITIMA DEL PERU	Peru	Maritime Training Centers/Institutes	(1) Teofilo Japura Gomez	21/09/2018
28	MINISTERIO DE AMBIENTE (MINAM)	Peru	Government Institutions	(3) Luis Antonio, Ibanez Guerrero, Luis Bravo	21/09/2018
29	SIMAPERU	Peru	Shipyards / Dry-docks	(2) Eduardo Jarrin, Irma Janet Zegarra Tello	24/09/2018
30	ESCUELA NACIONAL DE MARINA MERCANTE	Peru	Maritime Training Centers/Institutes	(1) Carlos Manuel Borja Garcia	24/09/2018
31	REPSOL	Peru	Marine Fuel Suppliers	(1) Ing. Arsedio Carbajal	24/09/2018
32	SEGUMAR	Panama	Maritime Administrations	(1) Rina Berrocal	20/06/2019
33	UNIVERSIDAD MARITIMA INTERNACIONAL DE PANAMA (UMIP)	Panama	Maritime Training Centers/Institutes	(1) Alexis Rodriguez	22/10/2019
34	CARNIVAL CRUISE LINES	Panama	Ship Owners / Operators	(2) Ross Kanzleitter, Chinmoy Desoy	13/08/2018
35	SECRETARIA DE ENERGIA	Panama	Government Institutions	(2) Shanishka Johnson, David E. Munoz	04/10/2018
36	MINISTERIO DE AMBIENTE	Panama	Government Institutions	(1) Veronica Gonzalez	04/10/2018
37	TRANSGAS	Panama	Ship Owners / Operators	(1) Rafael Ninalaya	18/09/2018
38	LLOYDS REGISTER	Panama	Recognized Organizations (ROs)	(1) Edilberto Peralta	20/09/2019
39	DIRECCION NACIONAL DE LOS ESPACIOS ACUATICOS (DIRNEA)	Ecuador	Maritime Administrations	(1) Vicente Alvarez	06/05.2019
40	ASTILLEROS NAVALES ECUATORIANOS - ASTINAVE EP	Ecuador	Shipyards / Dry-docks	(1) CPNV-SP Camilo Delgado Montenegro	08/05/2019
41	UNIVERSIDAD DEL PACIFICO	Ecuador	Maritime Training Centers/Institutes	(3) Julian Reyna, Ruben Mazon, Mario Palacios	13/05/2019
42	MINISTRY OF ENVIRONMENT	Ecuador	Government Institutions	(1) Michael Castaneda	09/05/2019
43	SUBSECRETARIA DE PUERTOS Y TRANSPORTE MARITIMO Y FLUVIAL	Ecuador	Government Institutions	(1) Ing. Eduardo Aguirre Zapata	07/05/2019
	43 questionnaires	**6 countries**	**covering all stakeholders categories**	**64 participating persons**	

Table 6-Detailed description of filled in questionnaires, per participating country and stakeholders category

1. Maritime Administrations		
Organization	**Country**	**Stakeholder Category**
DIMAR	Colombia	Maritime Administrations
UNICAPAM	Mexico	Maritime Administrations
DIRECCION GENERAL DE MARINA MERCANTE	Honduras	Maritime Administrations
DICAPI	Peru	Maritime Administrations
SEGUMAR	Panama	Maritime Administrations
DIRECCION NACIONAL DE LOS ESPACIOS ACUATICOS (DIRNEA)	Ecuador	Maritime Administrations
2. Government Institutions		
Organization	**Country**	**Stakeholder Category**
MINISTRY OF MINES & ENERGY	Colombia	Government Institutions
MINISTRY OF ENVIRONMENT & SUSTAINABLE DEVELOPMENT	Colombia	Government Institutions
CONUEE	Mexico	Government Institutions
MIN. DE TRANSPORTE Y COMUNICACIONES / AUTORIDAD PORTUARIA NACIONAL	Peru	Government Institutions
MINISTERIO DE ENERGIA Y MINAS (MINEM)	Peru	Government Institutions
MINISTERIO DE RELACIONES EXTERIORES	Peru	Government Institutions
MINISTERIO DE AMBIENTE (MINAM)	Peru	Government Institutions
SECRETARIA DE ENERGIA	Panama	Government Institutions
MINISTERIO DE AMBIENTE	Panama	Government Institutions
MINISTRY OF ENVIRONMENT	Ecuador	Government Institutions
SUBSECRETARIA DE PUERTOS Y TRANSPORTE MARITIMO Y FLUVIAL	Ecuador	Government Institutions

3. Ship Owners / Operators		
Organization	**Country**	**Stakeholder Category**
CAMARA MEXICANA DE LA INDUSTRIAL DEL TRANSPORTE MARITIMO	Mexico	Ship Owners / Operators
AGENCIA NAVIERA EUROPEA SA	Honduras	Ship Owners / Operators
NAVITRANSO	Peru	Ship Owners / Operators
TRANSGAS	Peru	Ship Owners / Operators
ASOCIACION NACIONAL DE ARMADORES	Peru	Ship Owners / Operators
CARNIVAL CRUISE LINES	Panama	Ship Owners / Operators
TRANSGAS	Panama	Ship Owners / Operators
4. Port Authorities / Operators		
Organization	**Country**	**Stakeholder Category**
SUPERINTENDENCE OF PORTS	Colombia	Port Authorities / Operators
PORT OF ROATAN	Honduras	Port Authorities / Operators
5. Maritime Training Centers/Institutes		
Organization	**Country**	**Stakeholder Category**
UNIVERSIDAD TECNOLOGICA DE BOLIVAR	Colombia	Maritime Training Centres/Institutes
AVANTE-ESCUELA DE MARINA MERCANTE	Colombia	Maritime Training Centres/Institutes
UNIVERSIDAD TECNOLOGICA DEL PERU	Peru	Maritime Training Centres/Institutes
UNIVERSIDAD MARITIMA DEL PERU	Peru	Maritime Training Centres/Institutes
ESCUELA NACIONAL DE MARINA MERCANTE	Peru	Maritime Training Centres/Institutes
UMIP	Panama	Maritime Training Centres/Institutes
UNIVERSIDAD DEL PACIFICO	Ecuador	Maritime Training Centres/Institutes

6. Marine Fuel Suppliers		
Organization	**Country**	**Stakeholder Category**
ECOPETROL	Colombia	Marine Fuel Suppliers
CHEVRON	Honduras	Marine Fuel Suppliers
BAY ISLAND PERTOLEUM	Honduras	Marine Fuel Suppliers
REPSOL	Peru	Marine Fuel Suppliers
7. Shipyards / Dry Docks		
Organization	**Country**	**Stakeholder Category**
COTECMAR	Colombia	Shipyards / Dry-docks
DIGECONSNAV	Mexico	Shipyards / Dry-docks
SIMAPERU	Peru	Shipyards / Dry-docks
ASTILLEROS NAVALES ECUATORIANOS - ASTINAVE EP	Ecuador	Shipyards / Dry-docks
8. Recognized Organizations		
Organization	**Country**	**Stakeholder Category**
LLOYDS REGISTER	Panama	Recognized Organizations (ROs)
9. National Policymakers		
Organization	**Country**	**Stakeholder Category**
EMPRESA NACIONAL PORTUARIA	Honduras	National Policymakers

Table 7-Summary of the questionnaires responses (per country)

Country	Regulatory Framework	Barriers/Constraints	Opportunities
Colombia	Non-signatory to MARPOL Annex VI -Absence of National Regulatory Framework -Many different players are involved in the establishment and subsequent implementation of a national policy on energy efficient measures	1.Capacity Building 2.Lack of technology experience 3.Lack of central leadership 4.Government Bureaucracy Others: -No cost effective solutions for energy efficient measures exist -No incentives for adopting/implementing EE measures exist -Benefits from use of energy efficient measures are not well explained -There is absence of baseline	-Training and raising of technical / environmental awareness at all levels (including crew onboard) are considered as key factors towards the transition to a more sustainable shipping. -Dialogue / co-operations are sought. -Enhanced environmental performance is considered the means towards greater competitiveness of their vessels, so there is a tendency towards energy efficient measures. -Incentives and research supported evidence are identified as key towards energy efficient measures increased implementation.
Ecuador	Non-signatory to MARPOL Annex VI -National Regulatory Framework exists at some extend and there is a tendency towards more environmental practices. -Many different players involved in the establishment and subsequent implementation of a national policy on energy efficient measures	1.Capacity Building 2.Lack of technology experience 3.New technologies / uncertainty Others: -No incentives for adopting/implementing EE measures exist -Benefits from use of energy efficient measures are not well explained	-Training and raising of technical / environmental awareness at all levels (including crew onboard) are considered as key factors towards the transition to a more sustainable shipping. -Dialogue / co-operations are sought -Enhanced environmental performance is considered the means towards greater competitiveness of their vessels, so there is a tendency towards energy efficient measures. -Incentives and research supported evidence are identified as key towards energy efficient measures increased implementation.
Honduras	Signatory to MARPOL Annex VI -Many different players involved in the establishment and subsequent implementation of a national policy on energy efficient measures	1.Capacity Building 2.Lack of technology experience 3.Lack of central leadership 4.Government Bureaucracy	-Training and raising of technical / environmental awareness at all levels (including crew onboard) are considered as key factors towards the transition to a more sustainable shipping. -Dialogue / co-operations are sought -Ship operators are anticipating support from Flag Administration for regulatory compliance (DCS)

Mexico	Non-signatory to MARPOL Annex VI -Absence of National Regulatory Framework -Many different players involved in the establishment and subsequent implementation of a national policy on energy efficient measures	1.Capacity Building 2.Lack of central Leadership 3.Government Bureaucracy 4.Lack of technology experience Others: -Benefits from use of energy efficient measures are not well explained	-Training and raising of technical / environmental awareness at all levels (including crew onboard) are considered as key factors towards the transition to a more sustainable shipping. --Dialogue / co-operations are sought
Panama	Signatory to MARPOL Annex VI -Many different players involved in the establishment and subsequent implementation of a national policy on energy efficient measures	1.Capacity Building 2.Lack of technology experience 3.New technologies / uncertainty Others: -Financial costs are considered the main barrier for adoption of energy efficient measures	-Ship operators recognize the opportunities for fuel costs savings through energy efficient measures for optimized ship performance, through effective use of their data. -Training and raising of technical / environmental awareness at all levels (including crew onboard) are considered as key factors towards the transition to a more sustainable shipping. -Dialogue / co-operations are sought -Enhanced environmental performance is considered the means towards greater competitiveness of their vessels, so there is a tendency towards energy efficient measures. -Incentives and research supported evidence are identified as key towards energy efficient measures increased implementation.
Peru	Signatory to MARPOL Annex VI -Many different players involved in the establishment and subsequent implementation of a national policy on energy efficient measures	1.Capacity Building 2.Lack of central leadership 3.Lack of technology experience 4.New technologies / uncertainty Others: Costs, Regulatory absence and lack of environmental awareness are identified as main barriers.	-Training and raising of technical / environmental awareness at all levels (including crew onboard) are considered as key factors towards the transition to a more sustainable shipping. -Dialogue / co-operations are sought -Ship operators are anticipating support from Flag Administration for regulatory compliance (DCS) -Enhanced environmental performance is considered the means towards greater competitiveness of their vessels, so there is a tendency towards energy efficient measures.

Note: Throughout the project implementation, efforts were made for addressing the identified barriers and to develop the identified opportunities. Primarily, efforts through dialogue and exchange of experience between participating countries representatives and through capacity building activities, including training.

Summary on questionnaires analysis results (per stakeholder category):

-Maritime Administrations (and reference on ROs acting on their behalf): In general, international regulations are followed for the shipping sector. For non-signatory countries to MARPOL Annex VI it appears to be much more difficult to follow the need for energy efficient measures implementation. IMO DCS compliance needs to be further supported through capacity building, as in general they are not ready to facilitate the process or rely on the appointed ROs to do so. This compromises their support towards their clients (ship owners / operators) who await guidance from them. Capacity building and dialogue / co-operations are considered key for overcoming the problems faced.
-Government Institutions, National Policymakers, Port Authorities / Operators: In all cases, it has been identified that many different players are involved in the adoption (and subsequent implementation) of a policy on energy efficient measures. This prevents actions towards that end, absence of national policies and forces responsible authorities to try at the extend possible to follow international regulations (MARPOL Annex VI). Capacity building and dialogue / co-operations are considered key for overcoming the problems faced.
-Ship Owners / Operators views in details: Training and raising of technical / environmental awareness at all levels (including crew onboard) is considered a key factor towards the transition to a more sustainable shipping. In general, guidance for IMO DCS compliance is anticipated by the Maritime Administrations. The need for better analyzing and communicating the benefits from energy efficient measures is raised, and incentives / motivation are sought from them, in order to implement such measures on a larger scale. Research is identified as a key contributor towards this end. The uncertainty of experimental new technologies and the high costs for implementation are restricting the use of certain energy efficient measures, however the companies understand the benefits of ship performance optimization, and see a potential to utilize regulatory compliance (IMO DCS) towards this end. Enhanced environmental performance is considered the means towards greater competitiveness of their vessels, so there is a tendency towards energy efficient measures. These mostly include measures that are easy to adopt and implement, cost effective, and make use mostly of common practice measures (hull coating, AFS) and already available systems onboard (ie autopilot, trim / draft optimization, hull coating / hull and propeller cleaning).
-Maritime Training Centres: Training and raising of technical / environmental awareness are considered as key factors towards the transition to a more sustainable shipping. They are ready to contribute as facilitators for relevant training activities, however they are recognizing the need for initial guidance and capacity building. Research is identified as a key contributor towards this end.
-Shipyards / Dry Docks: The lack of technology expertise on new technologies, the significant cost involved for adoption of energy efficient measures (with uncertainty) by ship operators, the lack of incentives encouraging adoption for such technologies are the primary barriers identified. Infrastructure and personnel could be utilized to support a turn towards greener shipping, however, training and raising of technical/environmental awareness is considered pre-requisite.

-Maritime Fuel Suppliers: The lack of infrastructure and technology expertise, coupled with significant investments / costs required for creating the necessary infrastructure, are the main barriers identified. These barriers prevent actions towards meeting the industry's requirements and needs on new fuel types, leading to non-capacity to facilitate the upcoming 2020 regulation (IMO Sulphur Cap).

Table 8-Summary on Energy Efficient Measures implemented onboard participating ships

No.	Ship (Type/No.)	GT	DWT	YOB	Last Hull Maint.	EEOI (g/DWT.nm)	Energy Savings Technologies Utilized During the Voyages within the reporting period												
							Hull Air Lubrication	Waste Heat Recovery	Solar Electricity	Wind Power	Weather Routing	Autopilot	Trim/Draft Optimization	Optimum Ballast Condition	Other : New Propeller	Other : PBCF / EPF	Other : Efficient hull coating	Other : Podded Propulsion	Other : Ducktail
1	Oil Tanker No.1	24048	38472	2005	01/02/2018	---	---	---	---	---	Yes	Yes	Yes	---	---	---	Yes	---	---
2	Oil Tanker No.2	20121	33755	2010	08/01/2018	9.164	---	---	---	---	Yes	Yes	---	---	---	---	Yes	---	---
3	Oil Tanker No.3	56172	105778	2004	13/06/2016	23.195	---	---	---	---	Yes	Yes	---	---	---	---	Yes	---	---
4	Oil Tanker No.4	3248	4999	2005	11/08/2017	---	---	---	---	---	Yes	Yes	---	---	---	---	Yes	---	---
5	Oil Tanker No.5	3248	4999	2005	08/11/2017	25.470	---	---	---	---	Yes	Yes	---	---	---	---	Yes	---	---
6	Oil Tanker No.6	2865	3543	2006	23/06/2018	---	---	---	---	---	Yes	Yes	Yes	---	---	---	Yes	---	---
7	Oil Tanker No.7	61888	11364	2017	01/03/2017	99.927	---	---	---	---	Yes	Yes	---	---	---	---	Yes	---	---
8	Oil Tanker No.8	13666	22062	2008	06/06/2018	---	---	---	---	---	Yes	Yes	Yes	---	---	---	Yes	---	---
9	Oil Tanker No.9	8848	14581	1999	09/02/2017	---	---	---	---	---	Yes	Yes	Yes	---	---	---	Yes	---	---
10	Oil Tanker No.10	38997	68500	2008	26/03/2018	---	---	---	---	---	Yes	Yes	Yes	---	---	---	Yes	---	---
11	Oil Tanker No.11	13425	21081	2003	16/05/2018	---	---	---	---	---	Yes	Yes	Yes	---	---	---	Yes	---	---
12	Oil Tanker No.12	27505	46683	2004	20/07/2017	---	---	---	---	---	Yes	Yes	Yes	---	---	---	Yes	---	---
13	Oil Tanker No.13	38997	63589	2008	07/12/2018	---	---	---	---	---	Yes	Yes	Yes	---	---	---	Yes	---	---
14	Oil Tanker No.14	30109	51215	2009	06/07/2014	---	---	---	---	---	Yes	Yes	Yes	---	---	---	Yes	---	---
15	Oil Tanker No.15	30010	49999	2009	15/09/2014	18.615	---	---	---	---	Yes	Yes	---	---	---	---	Yes	---	---
16	Oil Tanker No.16	42096	74543	2006	08/12/2018	5.562	---	---	---	---	Yes	Yes	Yes	---	---	---	Yes	---	---
17	Oil Tanker No.17	42096	74543	2006	22/12/2018	6.633	---	---	---	---	Yes	Yes	Yes	---	---	---	Yes	---	---
18	Container No.1	6406	8715	1998	20/12/2018	20.032	---	---	---	---	Yes	Yes	---	---	---	---	Yes	---	---
19	Container No.2	6385	8672	2000	02/02/2016	17.985	---	---	---	---	Yes	Yes	---	---	---	---	Yes	---	---
20	Other Cargo No.1	9611	12798	2004	01/10/2018	26.163	---	---	---	---	Yes	Yes	---	---	---	---	Yes	---	---
21	Bulk Carrier No.1	9961	17013	2007	09/09/2018	---	---	---	---	---	Yes	Yes	Yes	---	---	---	Yes	---	---
22	Bulk Carrier No.2	7265	12274	2001	16/02/2016	---	---	---	---	---	Yes	Yes	Yes	---	---	---	Yes	---	---
23	Bulk Carrier No.3	40040	76741	2006	05/11/2015	5.250	---	---	---	---	Yes	Yes	---	---	---	---	Yes	---	---
24	Bulk Carrier No.4	40040	76737	2004	21/01/2018	4.869	---	---	---	---	Yes	Yes	---	---	---	---	Yes	---	---
25	Bulk Carrier No.5	19920	32873	2000	01/11/2017	---	---	---	---	---	Yes	Yes	Yes	---	---	---	Yes	---	---
26	Container No.3	37518	42966	1996	29/10/2015	1.297	---	Yes	---	---	Yes	Yes	---	Yes	---	Yes	Yes	---	---
27	Container No.4	54304	68599	2004	04/06/2017	8.124	---	Yes	---	---	Yes	Yes	---	Yes	Yes	Yes	Yes	---	---
28	Container No.5	35954	42183	2004	28/12/2016	13.432	---	Yes	---	---	Yes	Yes	---	Yes	Yes	Yes	Yes	---	---
29	Container No.6	74071	74453	2002	10/07/2016	10.415	---	Yes	---	---	Yes	Yes	---	Yes	Yes	Yes	Yes	---	---
30	Container No.7	40108	52806	2002	25/11/2016	8.270	---	Yes	---	---	Yes	Yes	---	Yes	Yes	Yes	Yes	---	---
31	Container No.8	54304	68307	2004	07/08/2017	8.133	---	Yes	---	---	Yes	Yes	---	Yes	Yes	Yes	Yes	---	---
32	Container No.9	48220	56152	1993	04/06/2018	7.900	---	Yes	---	---	Yes	Yes	---	Yes	Yes	Yes	Yes	---	---
33	Container No.10	21586	21370	1982	21/11/2018	14.673	---	Yes	---	---	Yes	Yes	---	Yes	Yes	Yes	Yes	---	---
34	Container No.11	52181	60350	1990	22/02/2018	11.653	---	Yes	---	---	Yes	Yes	---	Yes	Yes	Yes	Yes	---	---
35	Container No.12	30280	35848	1998	27/11/2016	11.118	---	Yes	---	---	Yes	Yes	---	Yes	---	Yes	Yes	---	---
36	Container No.13	53208	67678	1999	07/08/2017	9.296	---	Yes	---	---	Yes	Yes	---	Yes	Yes	Yes	Yes	---	---
37	Container No.14	21586	21370	1982	31/08/2016	14.287	---	Yes	---	---	Yes	Yes	---	Yes	Yes	Yes	Yes	---	---
38	Container No.15	36389	42465	1988	05/09/2016	10.285	---	Yes	---	---	Yes	Yes	---	Yes	---	Yes	Yes	---	---
39	Container No.16	53208	67615	1999	14/09/2017	8.237	---	Yes	---	---	Yes	Yes	---	Yes	Yes	Yes	Yes	---	---
40	Container No.17	54881	68121	2004	02/05/2017	9.150	---	Yes	---	---	Yes	Yes	---	Yes	Yes	Yes	Yes	---	---
41	Container No.18	54304	68372	2004	25/05/2017	8.877	---	Yes	---	---	Yes	Yes	---	Yes	Yes	Yes	Yes	---	---
42	Container No.19	37579	45544	1997	08/09/2017	9.167	---	Yes	---	---	Yes	Yes	---	Yes	Yes	Yes	Yes	---	---

43	**Container No.20**	52181	60350	1990	20/06/2017	10.771	---	Yes	---	---	Yes	Yes	---	Yes	Yes	Yes	Yes	---	---
44	**Container No.21**	41225	53335	2008	22/06/2018	9.989	---	Yes	---	---	Yes	Yes	---	Yes	Yes	Yes	Yes	---	---
45	**Container No.22**	52191	67639	1989	06/04/2018	9.025	---	Yes	---	---	Yes	Yes	---	Yes	Yes	Yes	Yes	---	---
46	**Oil Tanker No.18**	28278	46337	2000	00/01/1900	13.582	---	Yes	---	---	Yes	Yes	Yes	Yes	---	---	Yes	---	---
47	**Chemical Tanker No.1**	27533	45063	1999	08/11/2018	15.309	---	---	---	---	Yes	Yes	---	---	---	---	Yes	---	---
48	**Chemical Tanker No.2**	27530	44577	1999	12/06/2016	13.841	---	---	---	---	Yes	Yes	---	---	---	---	Yes	---	---
49	**Oil Tanker No.19**	23298	37269	2005	24/08/2015	16.135	---	---	---	---	Yes	Yes	---	---	---	---	Yes	---	---
50	**Gas Carrier No.1**	22352	37661	1997	29/01/2017	28.152	---	---	---	---	Yes	Yes	---	---	---	---	Yes	---	---
51	**Chemical Tanker No.3**	30099	51392	2008	26/09/2016	13.339	---	---	---	---	Yes	Yes	---	---	---	---	Yes	---	---
52	**Gas Carrier No.2**	23519	29378	1996	15/01/2016	40.951	---	---	---	---	Yes	Yes	---	---	---	---	Yes	---	---
53	**Chemical Tanker No.4**	8259	14298	2002	02/11/2016	16.842	---	---	---	---	Yes	Yes	---	---	---	---	Yes	---	---
54	**Chemical Tanker No.5**	25507	38847	2004	23/06/2017	13.749	---	---	---	---	Yes	Yes	---	---	---	---	Yes	---	---
55	**Chemical Tanker No.6**	25431	49358	2005	07/07/2018	13.203	---	---	---	---	Yes	Yes	---	---	---	---	Yes	---	---
56	**LPG Carrier No.1**	10692	13777	1998	2018	---	---	Yes	---	---	Yes	Yes	Yes	Yes	---	---	Yes	---	---
57	**Passenger No.1**	128052	10250	2012	30/04/2017	135.857	---	Yes	---	---	Yes	Yes	Yes	Yes	---	---	Yes	---	---
58	**Passenger No.2**	110239	10000	2002	14/10/2017	116.878	---	Yes	---	---	Yes	Yes	Yes	Yes	---	---	Yes	---	---
59	**Passenger No.3**	128251	13815	2009	10/02/2017	105.661	---	Yes	---	---	Yes	Yes	Yes	Yes	---	---	Yes	---	---
60	**Passenger No.4**	70526	7200	1991	23/01/2017	119.878	---	Yes	---	---	Yes	Yes	Yes	Yes	---	---	Yes	---	---
61	**Passenger No.5**	70390	7498	1998	27/09/2017	102.972	---	Yes	---	---	Yes	Yes	Yes	Yes	---	---	Yes	Yes	Yes
62	**Passenger No.6**	70367	7200	1990	19/02/2016	129.098	---	Yes	---	---	Yes	Yes	Yes	Yes	---	---	Yes	---	---
63	**Passenger No.7**	70538	7180	1994	16/02/2018	130.072	---	Yes	---	---	Yes	Yes	Yes	Yes	---	---	Yes	---	---
64	**Passenger No.8**	110320	12870	2007	03/05/2014	108.182	---	Yes	---	---	Yes	Yes	Yes	Yes	---	---	Yes	---	---
65	**Passenger No.9**	110239	11100	2003	10/03/2017	107.934	---	Yes	---	---	Yes	Yes	Yes	Yes	---	---	Yes	---	---
66	**Passenger No.10**	133500	11000	2018	2018	117.375	---	Yes	---	---	Yes	Yes	Yes	Yes	---	---	Yes	Yes	Yes
67	**Passenger No.11**	70367	7180	1995	19/09/2016	127.122	---	Yes	---	---	Yes	Yes	Yes	Yes	---	---	Yes	---	---
68	**Passenger No.12**	70367	7180	1996	03/02/2016	118.286	---	Yes	---	---	Yes	Yes	Yes	Yes	---	---	Yes	---	---
69	**Passenger No.13**	85942	8983	2002	15/05/2018	124.546	---	Yes	---	---	Yes	Yes	Yes	Yes	---	---	Yes	Yes	---
70	**Passenger No.14**	110320	13294	2005	15/12/2016	91.251	---	Yes	---	---	Yes	Yes	Yes	Yes	---	---	Yes	---	---
71	**Passenger No.15**	128048	13800	2011	04/03/2016	121.840	---	Yes	---	---	Yes	Yes	Yes	Yes	---	---	Yes	---	---
72	**Passenger No.16**	85942	7089	2004	19/03/2015	166.402	---	Yes	---	---	Yes	Yes	Yes	Yes	---	---	Yes	Yes	---
73	**Passenger No.17**	70390	6894	1998	24/03/2018	124.171	---	Yes	---	---	Yes	Yes	Yes	Yes	---	---	Yes	Yes	Yes
74	**Passenger No.18**	85920	7200	2001	08/11/2014	184.278	---	Yes	---	---	Yes	Yes	Yes	Yes	---	---	Yes	Yes	---
75	**Passenger No.19**	70538	6870	1993	22/02/2017	120.697	---	Yes	---	---	Yes	Yes	Yes	Yes	---	---	Yes	---	---
76	**Passenger No.20**	85920	7200	2001	06/06/2018	154.455	---	Yes	---	---	Yes	Yes	Yes	Yes	---	---	Yes	Yes	Yes
77	**Passenger No.21**	113323	11843	2008	19/03/2016	117.504	---	Yes	---	---	Yes	Yes	Yes	Yes	---	---	Yes	---	---
78	**Passenger No.22**	103881	11142	1996	19/05/2016	108.382	---	Yes	---	---	Yes	Yes	Yes	Yes	---	---	Yes	---	---
79	**Passenger No.23**	101509	10984	1999	02/04/2016	---	---	Yes	---	---	Yes	Yes	Yes	Yes	---	---	Yes	---	---
80	**Passenger No.24**	110000	13294	2004	07/05/2016	94.992	---	Yes	---	---	Yes	Yes	Yes	Yes	---	---	Yes	---	---
81	**Passenger No.25**	101509	11774	2000	20/01/2018	100.043	---	Yes	---	---	Yes	Yes	Yes	Yes	---	---	Yes	---	---
82	**Passenger No.26**	133500	11000	2016	2016	126.232	---	Yes	---	---	Yes	Yes	Yes	Yes	---	---	Yes	Yes	Yes

On 2019 mid-year, the literary review of the legal provisions for the two (2) groups of countries signatory/non-signatory to MARPOL Annex IV was carried out and showed the following results:

Specific Issues of the countries that were part of the study:

Although the study divided countries into two groups, namely those that have approved Annex VI to the MARPOL Convention and those that are in the process of being approved, the reality of each country makes the list even more complex.

In some cases, progress is more significant than in others, institutional structures are very varied from country to country and there is often a gap between entities called to exercise their competences over the maritime sector of their respective countries.

The project was evaluated by the participating countries as of assistance in their ratification process (for those who have not ratified), however the processes are such that require significant time to complete.
In general, it was a commonly accepted fact that the MTCC Latin America contributed to the development of dialogue and interaction, and that through the capacity building activities and trainings it can play a crucial role in promoting effective regulatory enforcement and raising the level of technical awareness in the region.

Opportunities and strengths detected in the study:

- ***Dialogue and chance for development***: The MTCC project has become an important forum for discussion and an enabling agent for development among the agencies involved in the study, at the regional level. The work model adopted has enabled the establishment and strengthening of synergies resulting in higher and more effective performance among the intervening countries. This is mainly achieved through the training and capacity building activities, which are raising the level of technical awareness and also support the region's administrations in (1) enforcing more effectively the regulatory requirements, (2) supporting in turn the ship managers which are anticipating guidance from their ships flag administration and (3) supports the efforts for ratification of MARPOL Annex VI for the non-signatory states. Through the questionnaires, it is evident that dialogue is sought and MTCC Latin America can be the vital link to this end.

- ***Detection of training needs***: One of the objectives pursued by the creation of the MTCC Latin America Center is the training of maritime administrations and authorities in the region. This has been achieved through the various national and regional forums, facilitated by the Centre. From this academic exercise has emerged the initiative to launch a postgraduate program with specialization in Energy Efficiency in the Shipping Industry. The impact of this

proposal is strengthened by the fact that the host headquarters of the MTCC Latin America Center is precisely the International Maritime University of Panama (UMIP).

Obstacles or limitations detected:

- ***Plurality of maritime competences***: The attendance of different authorities sharing maritime competences in the different countries, which are part of the study, has been detected. In some cases, civil authorities share responsibilities with armed forces units, with a thin line dividing between their respective jurisdictions that sometimes overlap, making it difficult to implement international standards, as is the specific case of the MARPOL Convention.

- ***Lack of effective coordination between governmental entities***: In most of the countries under study, well-defined public policies and strategies are in place for climate change environmental management, however, there is a perceived gap between the authorities called to tackle the problem on the ground and those that must address it from the perspective of the maritime industry, without taking into account that, in the face of such a global problem, acting in a sectorized manner is not an option.

- ***A strong state bureaucracy***: The country-specific legal guidelines sometimes make it difficult to adopt international standards aimed at mitigating and addressing the problem of climate change. The lack of uniformity of criteria between the executive and the legislature slows the efforts of maritime administrations that have been working on the ratification of instruments such as Annex VI to the MARPOL Convention. From a technical point of view, everyone is aware of the need to take concrete measures to tackle the problem; however, these measures cannot be implemented without proper legal legitimacy.

6. Pilot Project 1 Outcomes

Goal Outcome #1:
A comprehensive questionnaire for data gathering together with its completion guidance to be prepared and at least 40 regional experts/relevant stakeholders to fill it in.

Activity #1 Outcome:
Nine (9) different questionnaires were devised, each addressing a specific key stakeholders category and 43 were filled in by a total of 64 participants, from 43 different organizations representing all stakeholders categories.

Goal Outcome #2:
At least three country case studies describing and analyzing implementation issues, lessons learned and recommendations to policy-makers completed.

Activity #2 Outcome:
Six (6) countries were selected to participate in Pilot Project 1, based on their total fleet and availability of vessels of 400GT and over, and taking into account various aspects (signatory/non-signatory to MARPOL Annex VI, PSC MOU participation), in order to ensure representative results and reliable conclusions. These countries are: Colombia, Ecuador, Honduras, Mexico, Panama, Peru.

Goal Outcome #3:
Session to communicate the results of PP1 during the second regional workshop.

Activity #3 Outcome:
Training session to communicate the results of this pilot project during the second regional workshop could not be delivered due to the cancellation of the event taking into account the political condition in Chile.
However, the dissemination material (brochure, article on project and training material) has been developed, disseminated through the MTCC channels and a relevant event will take place later on.

Goal Outcome #4:
Participation of MTCC-Latin America representatives in four dissemination activities to communicate the results, lessons and experiences learned during this pilot project.

Activity #4 Outcome:

Based on the project results, MTCC Latin America prepared relevant dissemination material including a summary of the project, training material on the project and its results (as reflected in Appendix 3 – Training Material of this report), brochures and one article on achievements of Pilot Project 1, which were disseminated through the regional/national workshops and online (website, newsletter, communications via emails etc., as reflected in Appendix 4 – Other Dissemination Material of this report) and even through personal meetings/interactions with participants, to return an output of the results.

Workshops included:

1. MTCC Latin America: First Regional Workshop (13th-15th March 2018, Panama City - Panama)
2. MTCC Latin America: First National Workshop (13th-15th June 2018, Panama City - Panama)
3. MTCC Latin America: Second National Workshop (22nd-24th August 2018, Cartagena - Colombia)
4. MTCC Latin America: Third National Workshop (14th-16th November 2018, Lima - Peru)
5. MTCC Latin America: Fourth National Workshop (13th-15th March 2019, Mexico City – Mexico)

Among the results of the nationals and regional workshop, we can list:

First Regional Workshop (13th-15th March 2018, Panama City - Panama)

From the group dynamic, specific information about the challenges faced by the industry stakeholders regarding the incorporation of energy efficiency, and various opportunities were listed:

Perceived constraints:
-environmental awareness of the main issues
-insufficient public investment on mitigation measures
-price of energy efficiency technology; and
-lack of a regulatory framework on energy efficiency

Opportunities for improvement perceived:
-attitudes towards green or ecological products;
-attitude to support renewable energy; and

Participation of national governmental organizations in regional & international agreements or schemes addressing climate mitigation issues.

First National Workshop (13th-15th June 2018, Panama City - Panama)

Main challenges:
- Costs of energy efficiency technology;
- Availability of alternative fuels; and
- Stability and potential changes in the government.

Opportunities:
- Opportunities for research and development;
- Participation of government agencies in regional agreements; and
- Increase environmental awareness

Second National Workshop (22nd-24th August 2018, Cartagena - Colombia)

Main challenges:
- Costs of energy efficiency technology;
- Environmental awareness; and
- National regulation on energy efficiency.

Main opportunities:
- Opportunities for research and development;
- Climate change mitigation measures; and
- Acceptance of renewable energy

Third National Workshop (14th-16th November 2018, Lima - Peru)

Challenges in the implementation of Annex VI of MARPOL:
- Knowledge about energy efficiency technology
- Research and development
- Availability of energy efficiency technology
- Availability of "green" or ecological products
- Availability of renewable energy
- Law regulating environmental pollution (prevention and control)

Main opportunities or aspects to use as leverage in the implementation of Annex VI of MARPOL:
- Commitment to the United Nations Sustainable Development Goals
- Peru is party to Annex VI of MARPOL
- Government participation in regional agreements
- Trade flows and patterns
- Exchange rates
- Acceptance towards "green" or ecological products

- Acceptance towards renewable energy
- Acceptance towards innovation
- Basic infrastructure
- Environmental law

Fourth National Workshop (13th-15th March 2019, Mexico City – Mexico)

Challenges in the accession and further implementation of Annex VI of MARPOL:

- Bureaucracy
- Tax incentives policy
- Stability of the government and probable changes
- Price of energy efficiency technology
- Lack of credit sources for energy efficiency initiatives
- Energy costs
- Environmental awareness
- Level of Education
- Acceptance towards renewable energy
- Alternative fuel availability
- Availability of energy efficiency technology
- Basic infrastructure
- Ship waste treatment
- Waste management
- Availability of renewable energy
- National regulation on energy efficiency
- Discrepancy with other national legislations
- Law regulating environmental pollution (prevention and control)

Main opportunities or aspects to use as leverage for accession and implementation of Annex VI of MARPOL:

- Commitment to the United Nations Sustainable Development Goals
- National policies on energy efficiency
- Government participation in regional agreements
- Lack of credit sources for energy efficiency initiatives
- Energy costs
- Trade flows and patterns
- Acceptance towards "green" or ecological products
- Environmental awareness
- Acceptance towards innovation
- Knowledge about energy efficiency technology
- Investigation and development
- Availability of energy efficiency technology
- Climate change mitigation measures
- Ship waste treatment
- Availability of "green" or ecological products

- Environmental law
- National regulation on energy efficiency
- Law regulating environmental pollution (prevention and control)

7. Dissemination of Project results

The MTCC Latin America Pilot Project 1 “Uptake of Ship Energy Efficient Technologies and Operations”, aims at utilizing the existing IMO regulation on ship energy efficient technologies and operations as a starting point, for examining the barriers and constraints faced by regional ship owners and operators when implementing or planning to implement such provisions and moving towards low carbon shipping.

Furthermore, this pilot project compares results, lessons learned and recommendations, and incorporated them into the dissemination material and dissemination activities, organized by the MTCC-Latin America in the region for dissemination purposes.

Dissemination material was drafted and dissemination activities of project results were ongoing, throughout the project’s implementation to maximize interest and engagement of stakeholders.

This was achieved through continuous development and updating of the training material (Appendix 3 of this study) and other dissemination materials (Appendix 4 of this study), to reflect the outcomes, experience gained and lessons learned through the project implementation up to the specific point, and their effective dissemination through the project’s dedicated website, social media as well as through interpersonal interactions and capacity building activities.

Full details and evidence on dissemination activities and the final training material, are included in Appendix 4 – Other dissemination material and Appendix 3 – Training Material, respectively.

More specifically, MTCC Latin America organized and participated in more than four (4) dissemination activities to communicate the results, lessons and experiences learned from Pilot Project 1.

Primarily, through the four (4) National Workshops and one (1) Regional Workshop, through which MTCC Latin America had the chance to interact and engage the key stakeholders of the organizing country, thus effectively communicating the results, lessons and experiences learned from Pilot Project 1.

Secondly, through dissemination of results through other means: website, newsletter, communications via emails etc.

Lastly, through personal meetings/interactions with participants, to return an output of the results

Dissemination activities (including dissemination of the final project report) will continue to be carried out after the project's completion as well, mainly through the MTCC Latin America's website and social media channels, to maximize the project's impact.

Project Successes

Area	Description
Capacity Building	To date the Pilot Project 1 has delivered 5 capacity-building workshops (as described in activity no.4 outcome above) across the participant countries, providing training on IMO's energy efficiency regulations, energy efficient ship operation, port state control and enforcement, as well as how to implement measures to improve efficiency on shipping, SEEMP Part I & Part II and the fuel data collection methodology in accordance with MARPOL Annex VI regulations. Almost 300 participants have been trained through MTCC Latin America facilitated workshops. Reference on the results of the nationals and regional workshop, is made in activity no.4 outcome above.
Assessment	• One of the major barriers to the effective implementation of the ship energy efficiency measures on the fleet of selected countries is the lack of training and practical experience with latest technology on the Government side. In addition, the heavy reliance in some Flag States for inspection of vessels and enforcement of provisions delegated to non-qualified staff. • In addition to this issue, some of the Flag States are not signatories to all MARPOL Annexes, which also hampers the implementation of the measures. • Flag States, where most merchant ships are registered such as Panama requires further development on the technical area and need to have more resources to properly carry out vessel assessments, inspections and verification of energy efficiency measures. • Consideration should be given to transfer knowledge to these states in order to further stimulate the adoption of energy efficiency technologies on their local fleet. • Also, the bureaucracy of the Government entities is playing a detrimental factor on implementing applicable measures. However, we noticed some business models that are properly combining the

	commercial aspect with the environmental target. This is the case of the Panama Canal Authority, which offers environmental programs that are being properly measured and are having an impact on the regional basis. • Each capacity building session also confirmed the interest of the countries to become more involved, however budget restrictions, staff changes after government elections and lack of leadership with a long-term vision are part of the problem.
Recommendations	• To publish a report with the measured CO2 emissions from shipping related to each country and make them aware of its impact at country level but also at regional level. • To continue with capacity building activities in order to persuade more people about this topic and create a multiplication effect on each country and to help them ratify and implement MARPOL Annex VI. • To publish a summary table of adopted regulations and conventions per country and obtain a commitment from each government to implement on their legislation the latest energy efficiency regulations from IMO.

9. Conclusions

-Maritime Administrations need to support ship operators for IMO DCS compliance through capacity building and training and raising of technical / environmental awareness at all levels (including crew onboard).

-Capacity building and dialogue / co-operations are considered key for progressing with national regulatory frameworks and energy efficient measures adoption and implementation in the region.

-There is an apparent need for better analyzing and communicating the benefits from energy efficient measures, and incentives / motivation are sought from the authorities, in order for ship owners/ operators to implement such measures on a larger scale. Research is identified as a key contributor towards this end.

-The uncertainty of experimental new technologies and the high costs for implementation are restricting the use of certain energy efficient measures, however the companies understand the benefits of ship performance optimization, and see a potential to utilize regulatory compliance (IMO DCS) towards this end.

-Enhanced environmental performance is considered the means towards greater competitiveness of vessels, so there is a tendency towards energy efficient measures. These mostly include measures that are easy to adopt and implement, cost effective, and make use mostly of common practice measures (hull coating, AFS) and already available systems onboard (ie autopilot, trim / draft optimization, hull coating / hull and propeller cleaning).

-The Maritime Training Centres consider training and raising of technical / environmental awareness a key factor towards the transition to a more sustainable shipping. They are ready to contribute as facilitators for relevant training activities, however they are recognizing the need for initial guidance and capacity building. Research is identified as a key contributor towards this end.

-Shipyards / Dry Docks consider the lack of technology expertise on new technologies, the significant cost involved for adoption of energy efficient measures (with uncertainty) by ship operators, the lack of incentives encouraging adoption for such technologies as the primary barriers for energy efficient measures adoption. Their infrastructure and personnel could be utilized to support a turn towards greener shipping, however, training and raising of technical/environmental awareness is considered pre-requisite.
-Maritime Fuel Suppliers of the region appear to be in lack of infrastructure and technology expertise, as well as reluctant to proceed with the investments / costs necessary for creating same in order to meet the industry’s requirements / needs on new fuel types,

causing their declared non-capacity to facilitate the upcoming 2020 regulation (IMO Sulphur Cap).

Opportunities and strengths detected in the study:

- Opportunity for dialogue and development
- Identification of training needs
- Attitudes towards "green" or ecological products
- Attitudes and support for renewable energy
- Government participation in regional / international agreements

Obstacles or limitations detected:

- Plurality of maritime competences
- Lack of effective coordination between government entities
- A strong state bureaucracy

Slow adoption of new technologies is evident. Companies tend to make use of energy efficient measures that require low cost, are easy to implement and maintain, which do not cause major changes in vessel's schedule for installation. Primarily software, and also hull coating which they implement as common practice.

However, by incentivizing, enabling and raising awareness, this can change.

Lessons Learned

-Taking into account the energy efficient measures implemented onboard the participating vessels of Pilot Project 1, and with reference to their technical characteristics / cost (ref. made to GloMEEP information on energy efficient measures), it is evident that existing technologies implemented onboard, may offer immediate positive impact in the efforts for GHG emissions reduction.
The answers received in the questionnaires reveal that the ship management companies understand the benefits of ship performance optimization. Regulatory compliance can thus play a key role towards that end and in fact participating ship management companies see a potential to utilize regulatory compliance (IMO DCS) towards this end.

-Enhanced environmental performance is considered the means towards greater competitiveness of vessels, so there is a tendency towards energy efficient measures. These mostly include measures that are easy to adopt and implement, cost effective, and make use mostly of common practice measures (hull coating, AFS) and already available systems onboard (ie autopilot, trim / draft optimization, hull coating / hull and propeller cleaning).

Recommendations

Based on the Conclusions described above, it is highly recommended to exploit the expertise gained by the MTCC Latin America and its activities so far, for supporting the overall efforts towards a more sustainable shipping in the region.

General views and recommendations for MTCC Latin America:

It is highly recommended that MTCC Latin America continues its research activities on energy efficient operation of ships, since the experience, knowhow and data collected enable to expand the scope of research and analysis.

Proposed future activities include:
-Training activities, for raising the environmental and technical awareness in the region
-Research and development activities, including:
-Ships fuel consumption and GHG emissions for automating the data collection process as far as practicable.
-Ports / regional monitoring of ship traffic and emissions.

Especially under a capacity of a Research Institution, the MTCC Latin America is possible to:

i. Support effectively the region's activities, thus maintaining its dominating position, exploiting its relations and partnerships and raising its status.
ii. Gain access (through International & EU cooperation) to funding programmes, thus creating revenue for supporting its activities and ensuring its self-sustainability.

Appendix 1 - Literature Review Reports for Participating Countries: Countries details

See document attached to this report

Appendix 2 - Stakeholders Questionnaires Samples

Questionnaire for Maritime Administrations

Questionnaire for Government Institutions

Questionnaire for National Policies

Questionnaire for Shipyard

Questionnaire for Training Centers

Questionnaire for port authorities and private terminals

Questionnaire for Recognized Organizations (ROs)

Questionnaire for Marine Fuel Suppliers

Questionnaire for Ship Owners

Questionnaire for Maritime Administrations

Pilot Project 1
"Uptake of Ship Energy Efficient Technologies and Operations"

(MARITIME ADMINISTRATIONS)

Interview Form

General Information:

Name	
Date	
Organization	
Country	

Dear Interviewee:

As part of the Information Gathering Process for this Pilot Project 1, we welcome your opinion on the following topics:

1. About your Organization
1.1 What is the scope, objectives, functions, and main activities of your organization
2. Policies and Regulations
2.1 What are the Policies on Energy Efficiency, applicable to the Shipping Industry, developed / implemented by your Maritime Administrations? Please provide details
2.2 What are the Regulations on Ships Energy Efficiency developed / implemented by your Maritime Administration? Please provide details
2.3 Which are the Monitoring Mechanisms and Technologies adopted / implemented by your Maritime Administration?
2.4 Which Department is it responsible for these Monitoring Duties?
3. About the Fleet
3.1 Provide information on: - Number of Ships to which EE applies - Type of Ships - Area of Operation
3.2 How many ships do these provisions of MARPOL 73/78 Convention – Annex VI on Ships Energy Efficiency apply to?

3.3 What technologies is approving / adopting / implementing your Administration related to Energy Efficiency? Please provide details

-Hull Air Lubrication	-Autopilot
-Waste heat recovery	-Trim/Draft Optimization
-Solar Electricity	-Optimum Ballast Condition
-Wind power	-Others
-Weather routing	

4. Process

4.1 Does your Organization have Protocols / Procedures / Guides / Instructions on Energy Efficiency on board the vessels flying your flag? Please provide details

4.2 What is the Role of the Recognized Organizations when implementing and monitoring the measures on Ships Energy Efficiency? Please provide details

5. Barriers / Challenges / Constraints

5.1 What are the barriers / challenges / constraints faced by your Organization when implementing the provisions or measures on energy efficiency onboard the vessels flying your flag? Please provide details

5.2 What have been its impacts and why? Please provide details

6. Opportunities

6.1 What are the opportunities that your Organization has observed when implementing the provisions or measures on energy efficiency onboard the vessels flying your flag?

6.2 What have been its impacts and why? Please provide details

7. Recommendations

7.1 What are the recommendations that your Organization can provide based on the experience gained when implementing the provisions or measures on energy efficiency onboard the vessels flying your flag?

7.2 What have been its impacts and why? Please provide details

8. Lessons learned

8.1 What are the lessons learned by your Organization when implementing the provisions or measures on energy efficiency onboard the vessels flying your flag? Please provide details

8.2 What have been its implications and why? Please provide details

Signature or Initials: _____

Questionnaire for Government Institutions

Pilot Project 1
"Uptake of Ship Energy Efficient Technologies and Operations"

(GOVERNMENT INSTITUTIONS)
Interview Form

General Information:

Name	
Date	
Organization	
Country	

Dear Interviewee:
As part of the Information Gathering Process for this Pilot Project 1, we welcome your opinion on the following topics:

1. Policies and Regulations
1.1 What is the Role of your Organization in the development of Policies and Regulations on Energy Efficiency and Climate Change, which are related to the Shipping Industry? Please provide details
1.2 Which are these Policies and Regulations on Energy Efficiency and what are the objectives, final results, and deadlines for implementation? Please provide details
1.3 Who are the Main Stakeholders in determining the previously specified policies / regulations?
2. Barriers / Challenges / Constraints
2.1 What are the barriers / challenges / constraints faced / foreseen by your Organization when implementing the provisions or measures on energy efficiency?
2.2 What is the feedback that your Organization has received from the Maritime Industry when implementing the provisions or measures on Energy Efficiency?
2.3 What have been its impacts and why? Please provide details
3. Opportunities
3.1 What are the opportunities that your Organization has observed when implementing the provisions or measures on Ships Energy Efficiency?
3.2 What have been its impacts and why? Please provide details
4. Recommendations

4.1 What are the recommendations that your Organization can provide based on the experience gained?
4.2 What have been its impacts and why? Please provide details
5. Lessons Learned
5.1 What are the lessons learned by your Organization when implementing the provisions on this subject? Please provide details
5.2 What have been its impacts and why? Please provide details

Signature or Initials: _____

Questionnaire for National Policies

Pilot Project 1

"Uptake of Ship Energy Efficient Technologies and Operations"

(NATIONAL POLICIES)

Interview Form

General Information:

Name	
Date	
Organization	
Country	

Dear Interviewee:
As part of the Information Gathering Process for this Pilot Project 1, we welcome your opinion on the following topics:

1. Policies and Regulations
1.1 What is the Role of your Organization in the development of Policies and Regulations on Energy Efficiency and Climate Change, which are related to the Shipping Industry? Please provide details
1.2 Which are these Policies and Regulations on Energy Efficiency and the objectives, results, and deadlines for implementation? Please provide details
1.3 Who are the Main Stakeholders in determining the previously specified policies / regulations?
2. Barriers / Challenges / Constraints
2.1 What are the barriers / challenges / constraints faced / foreseen by your Organization when implementing these provisions or measures?
2.2 What is the feedback that your Organization has received from the Maritime Industry when implementing the provisions or measures on Energy Efficiency? Please provide details
2.3 What have been its impacts and why? Please provide details
3. Opportunities
3.1 What are the opportunities that your Organization has observed when implementing the provisions or measures on Ships Energy Efficiency in the Maritime Transport Industry?
3.2 What have been its impacts and why? Please provide details
4. Recommendations

4.1 What are the recommendations that your Organization can provide based on the experience gained?
4.2 What have been its impacts and why? Please provide details
5. Lessons learned
5.1 What are the lessons learned by your Organization when implementing the provisions on this subject? Please provide details
5.2 What have been its impacts and why? Please provide details

Iniciales o Firma: _____

Questionnaire for Shipyard

Pilot Project 1
"Uptake of Ship Energy Efficient Technologies and Operations"

(SHIPYARD)
Interview Form

General Information:

Name	
Date	
Organization	
Country	

Dear Interviewee:

As part of the Information Gathering Process for this Pilot Project 1, we welcome your opinion on the following topics:

1. About your Organization
1.1 What is the scope, objectives, functions, and main activities of your organization?
2. Policies and Regulations
2.1 Do you know any policy on Energy Efficiency, applicable to the Maritime Transport Industry, which has been developed / implemented by your Maritime Administration? Please provide details
2.2 Do you know the Regulation on Ships Energy Efficiency / implemented by your Administration? Please provide details
3. About the Shipyard
3.1 Provide information on: - Shipyard Structure - Type of vessels received at the Shipyard - Kind of services provided by the Shipyard
3.2 Is there any policy in place on Energy Efficiency in your Organization? Please provide details
3.3 Are there measures in your Organization on Energy Efficiency to avoid or reduce atmospheric pollution? Please provide details.

- Scrubber Installations and Sulphur Content Removers	- Condition and Optimization of the use of propellers
- Tuning of Main and Auxiliaries Machineries	- Any device on Energy Efficiency

	- Hull Cleaning and Painting	- Any consulting on optimal machinery performance and navigational speed
3.4 What are the preparations and considerations adopted by your Organization to meet the requirements under the provisions on energy efficiency? Please provide details		
4. Barriers / Challenges / Constraints		
4.1 What are the barriers / challenges / constraints faced by your Organization when implementing the provisions or measures on energy efficiency? Please provide details		
4.2 What have been its implications and why? Please provide details		
5. Opportunities		
5.1 What are the opportunities that your Organization has observed when implementing the provisions or measures on energy efficiency?		
5.2 What have been its impacts and why? Please provide details		
6. Recommendations		
6.1 What are the recommendations that your Organization can provide based on the experience gained when implementing the provisions or measures on energy efficiency?		
6.2 What have been its impacts and why? Please provide details		
7. Lessons Learned		
7.1 What are the lessons learned by your Organization when implementing the provisions or measures on energy efficiency? Please provide details		
7.2 What have been its impacts and why? Please provide details		

Signature or Initials: _____

Questionnaire for Training Centers

Pilot Project 1
"Uptake of Ship Energy Efficient Technologies and Operations"

(TRAINING CENTERS)
Interview Form

General Information:

Name	
Date	
Organization	
Country	

Dear Interviewee:

As part of the Information Gathering Process for this Pilot Project 1, we welcome your opinion on the following topics:

1. Policies / Regulations
1.1 Is your Organization aware of the development of Policies (from Government and Industry) related to Energy Efficiency measures applicable to the Shipping Industry? Please provide details
1.2 Is your Organization aware of the development of national and international Regulations related to Energy Efficiency, which have been promoted by your Maritime Administration? Provide details
1.3 How are these policies and regulations reflected in your academic offer and technical courses of your Organization? Please provide details
1.4 What feedback you have received from the seafarers or other participants who have completed maritime courses/trainings at your facilities?
1.5 Do you know the Technologies in place for the Gases Emission Control? Please provide details
2. Barriers / Challenges / Constraints
2.1 What are the barriers / challenges / constraints faced by your Organization when implementing the provisions or measures on energy efficiency?
2.2 What have been its impacts and why? Please provide details
3. Opportunities
3.1 What are the opportunities that your Organization has observed when implementing the provisions or measures on energy efficiency?
3.2 What have been its impacts and why? Please provide details
4. Recommendations

4.1 What are the recommendations that your Organization can provide based on the experience gained?
4.2 What have been its impacts and why? Please provide details
5. Lessons Learned
5.1 What are the lessons learned by your Organization in this matter? Please provide details
5.2 What have been its impacts and why? Please provide details

Signature or Initials: _____

Questionnaire for port authorities and private terminals

Pilot Project 1
"Uptake of Ship Energy Efficient Technologies and Operations"

(PORT AUTHORITIES / PRIVATE TERMINALS)
Interview Form

General Information:

Name	
Date	
Organization	
Country	

Dear Interviewee:
As part of the Information Gathering Process for this Pilot Project 1, we welcome your opinion on the following topics:

1. About your Organization
1.1 What is the mandate, objectives, functions, and main activities of your organization?
2. Policies and Regulations
2.1 Do you know any policy on Energy Efficiency, applicable to the Maritime Transport Industry, which has been developed / implemented by your Maritime Administration? Please provide details
2.2 Do you know the Regulation on Ships Energy Efficiency developed / implemented by your Maritime Administration? Please provide details
3. About the Port
3.1 Provide information on: - Type of Port - Type of vessels calling your Port - Traffic of vessels
3.2 Are there policies in place on Energy Efficiency in your Organization? Please provide details
3.3 Are there measures in place on Energy Efficiency to avoid or reduce atmospheric pollution in your Organization? Please provide details

- Electric Engines / Motors	- Power from shore
- LED Lightings	- Others

3.4 What incentives have approved or adopted your Organization in terms of Energy Efficiency? Please provide details
4. Process

4.1 Does your Organization have Protocols / Procedures / Guidelines / Instructions on Energy Efficiency? Please provide details
4.2 Does your Organization have audit programs on Energy Efficiency? Please provide details
5. Barriers / Challenges / Constraints
5.1 What are the barriers / challenges / constraints faced by your Organization when implementing the provisions or measures on energy efficiency? Please provide details
5.2 What have been its implications and why? Please provide details
6. Opportunities
6.1 What are the opportunities that your Organization has observed when implementing the provisions or measures on Ships Energy Efficiency?
6.2 What have been its implications and why? Please provide details
7. Recommendations
7.1 What are the recommendations that your Organization can provide based on the experience gained when implementing the provisions or measures on energy efficiency?
7.2 What have been its implications and why? Please provide details
8. Lessons learned
8.1 What are the lessons learned by your Organization when implementing the provisions or measures on energy efficiency? Please provide details
8.2 What have been its implications and why? Please provide details

Signature or Initials: _____

Questionnaire for Recognized Organizations (ROs)

Pilot Project 1
"Uptake of Ship Energy Efficient Technologies and Operations"

(RECOGNIZED ORGANIZATIONS)
Interview Form

General Information:

Name	
Date	
Organization	
Country	

Dear Interviewee:
As part of the Information Gathering Process for this Pilot Project 1, we welcome your opinion on the following topics:

1. Policies and Regulations
1.1 Is your Organization aware of any policy on Energy Efficiency, applicable to the Maritime Transport Industry, which has been developed / implemented by your Maritime Administration? Please provide details
1.2 Is your Organization aware of any Regulation on Ships Energy Efficiency? Please provide details
1.3 Is your Organization familiar with the International Provisions found in: Chapter IV, Annex VI of MARPOL 73/78 Convention?
2. About your Organization
2.1 What is the mandate, objectives, functions, and main activities of your organization? Please detail
2.2 What is the composition of the fleet to which you provide your services? Please provide details
2.3 What is the role of your Organization in the development of measures on Ship Energy Efficiency? Please provide details
2.4 Which are the activities that your Organization would do in attention to the provisions on Ships Energy Efficiency? Please provide details

- Approve the SEEMP	- Issue the Certificate of Compliance
-Others	

3. Process

3.1 Does your Organization have Protocols / Procedures / Guides / Instructions on Energy Efficiency Measures on board the vessels? Please provide details
4. Barreras/Desafíos/Limitaciones
4.1 What are the barriers / challenges / constraints faced / foreseen by your Organization when implementing the provisions or measures on energy efficiency? Please provide details
4.2 What have been its impacts and why? Please provide details
5. Opportunities
5.1 What are the opportunities that your Organization has observed when implementing the provisions or measures on Ships Energy Efficiency?
5.2 What have been its impacts and why? Please provide details
6. Recommendations
6.1 What are the recommendations that your Organization can provide based on the experience gained when implementing the provisions or measures on Ship Energy Efficiency?
6.2 What have been its impacts and why? Please provide details
7. Lessons learned
7.1 What are the lessons learned by your Organization when implementing the provisions of Ship Energy Efficiency? Please provide details
7.2 What have been its impacts and why? Please provide details

Signature or Initials: _____

Questionnaire for Marine Fuel Suppliers

Pilot Project 1
"Uptake of Ship Energy Efficient Technologies and Operations"

(MARINE FUEL SUPPLIERS)
Interview Form

General Information:

Name	
Date	
Organization	
Country	

Dear Interviewee:
As part of the Information Gathering Process for this Pilot Project 1, we welcome your opinion on the following topics:

1. Policies and Regulations
1.1 Are you aware of any policy on Energy Efficiency, applicable to the Shipping Industry, which has been developed / implemented by your Maritime Administration? Please provide details
1.2 Are you aware of any Regulation on Ships Energy Efficiency? Please provide details
2. About your Company and EE
2.1 What type of Marine Fuels your Company currently offer to the Industry, which are less polluting in relation to the 0.5% of Sulfur Content established from 1 January 2020.
2.2 What is the role of your Organization in relation to Production, Refining Process and Distribution of Marine Fuels in the Country?
2.3 How these Provisions on Gases Emission Control from Ships and Energy efficiency Measures are impacting the Country, and affecting your Role of Production, Refining Process and Distribution of Marine Fuels?
3. Process
3.1 Have these New Provisions impacted the Technologies used during the different process of Production, Refining and Distribution of Marine Fuels in your Organization? Please provide details
3.2 What is your prediction on the availability of Marine Fuels that comply with the new Provisions in your Country?
3.3 What is the impact foresee for the Industry?
4. Barriers / Challenges / Constraints

4.1 What are the barriers / challenges / constraints faced / foreseen by your Organization when implementing the provisions or measures on energy efficiency? Please provide details
4.2 What have been its impacts and why? Please provide details
5. Opportunities
5.1 What are the opportunities that your Organization has considered when implementing the new measures?
5.2 What have been its impacts and why? Please provide details
6. Recommendations
6.1 What are the recommendations that your Organization can provide based on the experience gained?
6.2 What have been its impacts and why? Please provide details
7. Lessons learned
7.1 What are the lessons learned by your Organization when implementing the provisions on this matter? Please provide details
7.2 What have been its impacts and why? Please provide details

Signature or Initials: _____

Pilot Project 1
"Uptake of Ship Energy Efficient Technologies and Operations"

(SHIP OWNERS / OPERATORS)
Interview Form

General Information:

Name	
Date	
Organization	
Country	

Dear Interviewee:

As part of the Information Gathering Process for this Pilot Project 1, we welcome your opinion on the following topics:

1. Policies and Regulations
1.1 Are you aware of any policy on Energy Efficiency, applicable to the Shipping Industry, which has been developed / implemented by your Ship´s Flag Maritime Administration? Please provide details
1.2 Are you aware of any Regulation on Ships Energy Efficiency? Please provide details
1.3 Is there any regulation on Energy Efficiency in your Company applied to your vessels? Please provide details
2. Energy Efficiency in the Company
2.1 Provide information on: - Number of Ships - Type of Ships - Area of Operation - Size of the Company (1-10, 10-50, 50-100, over 100) - Which department in your Company deals with technical aspects of the vessels (EE Monitoring)
2.2 How many ships do these provisions of MARPOL 73/78 Convention – Annex VI on Ships Energy Efficiency apply to?
2.3 Do the vessels under your management have implemented technologies on Energy Efficiency? Please provide details

-Hull Air Lubrication	-Autopilot
-Waste heat recovery	-Trim/Draft Optimization
-Solar Electricity	-Optimum Ballast Condition

	-Wind power	-Other:	
	-Weather routing		
3. Process			
3.1 Does your Organization have Protocols / Procedures / Guides / Instructions on Energy Efficiency on board the vessels under your management? Please provide details			
4. Barriers / Challenges / Constraints			
4.1 What are the barriers / challenges / constraints faced / foreseen by your Organization when implementing the provisions or measures on energy efficiency? Please provide details			
4.2 What have been its impacts and why? Please provide details			
5. Opportunities			
5.1 What are the opportunities that your Organization has observed when implementing the provisions or measures on Ships Energy Efficiency?			
5.2 What have been its impacts and why? Please provide details			
6. Recommendations			
6.1 What are the recommendations that your Organization can provide based on the experience gained?			
6.2 What have been its impacts and why? Please provide details			
7. Lessons learned			
7.1 What are the lessons learned by your Organization when implementing the provisions of Ship Energy Efficiency? Please provide details			
7.2 What have been its impacts and why? Please provide details			

Signature or Initials: _____

Appendix 3 - Training Material

See document attached to this report

Appendix 4 - Other dissemination Material

See document attached to this report

Appendix 5-Other information

Refer to electronic files attached to this report (USB)