

MARITIME TECHNOLOGY COOPERATION CENTRE IN THE PACIFIC (MTCC-PACIFIC)

CAPACITY BUILDING FOR CLIMATE MITIGATION IN THE MARITIME SHIPPING INDUSTRY
THE GLOBAL MTCC NETWORK (GMN) PROJECT

PILOT PROJECT 2: FUEL CONSUMPTION DATA COLLECTION AND REPORTING REPORT



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Executive summary

This report of the pilot project 1 on data collection and reporting is one the deliverables under SPC-IMO contract from the Maritime Technology Cooperation Centre in the Pacific (MTCC-Pacific). This report aims at providing details of the data collected with analysis of the data. The report builds on Pilot Project 1 report and MTCC-Pacific capacity-building activities conducted in 2017-2019 during

which consultation was carried out with ship and government officials. It also uses information from the report submitted on National Technology Needs Assessment Report.

As part of the pilot-project, MTCC-Pacific distributed a harmonized data collection template which was incorporated with Ship Management Systems (SMS) as a follow-up of the national workshops. The outcome of the national workshop formalized an agreement with the in-country focal point to be the designated person ashore to liaise with MTCC-Pacific. Continuous assistance to ship operators in the targeted countries were provided to implement the data collection and reporting system. Data collection activities will need to continue in order to analyse data on energy consumption and greenhouse gas emissions to inform and guide operators toward energy efficient operations and investment in new technology and new concept vessels/equipment. With consistent data, it can be clearly demonstrated the potential and benefits of up taking new technologies and operations in the Pacific maritime transport sector.

MTCC-Pacific also recognised the need for a fundamental behavioural shift in business management whereby ship operators fully appreciate the benefits of effective business management practices. The assistance activities to the private sector focused on safe management system, energy efficiency measures and data collection but should also include understanding on how to run a maritime business, operate vessels efficiently and plan for investments. The capacity of small maritime enterprises operating vessels to implement and continuously improve business management systems is paramount to uptake internationally recognized standards and best practices.

MTCC-Pacific has faced numerous challenges to access reliable, consistent and timely data and to demonstrate the benefits of energy efficiency measures to ship operators. It was difficult to carry out verifications, implement analysis standards and techniques. In addition, the shortage of competent people at the country level (with administration and ship operators) to assist the project team resulted in challenges for the delivery of the two pilot projects. Despite commitment at higher levels, leadership and ownership in the administration and domestic ship operator capacity must be improved. Given that IMO data collection requirements are not applicable to domestic vessels, data collection should be made mandatory through domestication of MARPOL Annex VI and use the SPC's template developed by MTCC-Pacific to capture accurate data required for analysis. Most of the vessel in the region are old and have no access to affordable fuel flow meters and monitoring equipment to check quality assurance of diesel fuel supplied. Ship Operators are also adamant to share sensitive fuel consumption data due to stiff competition with competitors.

1. Pilot Project 2: Fuel consumption data collection and reporting

The same approach that for the pilot-project 1 was used to deliver the activities and achieve the objective to: i) adopt an harmonised data collection and reporting system for the Pacific region; ii) agree on the harmonised system at the national level in at least all targeted countries; and iii) collect

and analyse the data and information to inform decision-making. The scope of the result 4 has covered at least the targeted countries, shipping companies of Result 3.

In this pilot-project, the first step developed and disseminated to all PICTs during RW and NW, data collection template (R4.1) and shipping companies along with the ships EEDIs using the Energy Efficiency Appraisal Tool developed by IMO. A generic regulation for data collection was also developed (R4.2) to assist countries in reinforcing the framework and ensuring the sustainability of the data collection and reporting system.

The second step (R4.3) was rolled out with PIDSS programme with an already existing, PIDSS network in targeted countries with maritime administration and ship owners. A harmonized data collection template was integrated with SMS and disseminated during the national workshops. The outcome of the national workshop formalized an agreement with the in-country focal point to be the designated person ashore to liaise with MTCC-Pacific. Continuous assistance to ship operators in the targeted countries were provided to implement the data collection and reporting system.

The third step focused on the desk study of all data and information collected to produce this report on GHG emissions in the Pacific maritime transport sector (R4.4). Consistent data from targeted shipping companies in targeted countries would have allowed an accurate estimation of GHG emissions in target countries using the vessel lists and domestic routes contained in SPC's Regional Data Repository. The analysis would have also informed countries on GHG emissions from their maritime transport sector and would ultimately support their Nationally Determined Contributions (NDCs).

As experienced for years, collecting data in the PICs remains a challenge due to lack of data available and lack of resources in-country to collect these data and process it in a standardized database. It was therefore essential to utilise any in-country technical assistance visit to complete and update the data collection templates. Photos of most of the vessels visited for the pilot projects are listed by country in Annex 1.

This pilot-project was conducted taking into account the IMO Guidelines for Administration Data Verification Procedures and for electronic communication and standardized data reporting. However, verification was difficult for various reason but the most crucial was inconsistent data.

In future we will review and adapt the SPC Regional Database to ensure it has functionalities that will allow easy access from countries to their own and public access for data after treatment. This will be guided by the IMO Guidelines for the development and management of the IMO Ship Fuel Consumption Database.

The table below details the activities carried out in the scope of this pilot-project with indicators and timeframe and description of the activity content.

Table 1. Progress status

Intermediate Results (IR)	Status	Target	Comments
IR4.1 Developed and disseminated a data collection template	Completed with extra result	All PICs maritime administration are recipients of data collection template to be disseminated to their shipowners	<p>All PICs maritime administration were provided with fuel oil consumption data templates during the RW & NW listed below;</p> <ol style="list-style-type: none"> 1) Regional Conference and Official Launch of MTCC-Pacific ... 12-15 December 2017 2) Fiji National Workshop 24-28 October 2017 3) Solomon Islands National Workshop 13-15 February 2018 4) Vanuatu National Workshop 27-29 March 2018 5) Tuvalu National Workshop 9-11 May 2017 6) Samoa National Workshop 12-14 June 2018 7) Kiribati National Workshop 21-23 June 2018 8) Marshall Islands National Workshop 20-22 August 2018 <p>Beyond</p> <ol style="list-style-type: none"> 1) Cook Islands 15 -17 April 2019
IR4.2 Developed and disseminated a generic regulation for data collection for ships, shipping companies and ports	Completed	All PICs governments are recipients of data collection and reporting system regulation	All PICs governments received data collection and reporting system regulation. Refer <i>Annex 2 – Regulations on Ships Energy Efficiency Data Collection System for their Fuel Oil Consumption 2019</i>
IR4.3 Collected relevant data and information	Completed	Data are collected and reported to the Targeted countries governments and the Pacific MTCC in EDDIE GHG emissions by ships, shipping companies and ports are calculated	Please refer to “ <i>Table 4. List of vessels voluntarily took part in pilot project</i> ”
IR4.4 Analysed data and information and produced a report on GHG emissions in the Pacific maritime sector	Completed	Report on GHG emissions from the Pacific maritime sector and experiences on the uptake on low-carbon technology and operation is published	Please refer to section “ <i>5.1.Targeted Countries vessel data analysis and verification</i> ” for data analysis.

1.1. Data collection, analysis and verification

Voluntarily ship operators from Fiji, Kiribati, Solomon Islands, Vanuatu, Tuvalu and Samoa have submitted data to MTCC-Pacific. It is to be noted that the data collected are often inconsistent, varied and all voyages are not always captured.

Country	Age	GRT	Length	Vessel Type	DC	SEEMP
Fiji	-	400	42.88	Cargo & Passenger	-	1
	5	495	47	Cargo & Passenger	-	1
	6	495	47	Cargo & Passenger	-	1
	55	-	-	Cargo & Passenger	-	1
	-	-	-	Fishing vessel	-	1
	3	-	-	Special vessel	-	1
	8	149	47	Cargo & Passenger	1	1
	27	-	-	Cargo & Passenger	1	-
	27	-	-	Cargo & Passenger	-	1
	27	-	-	Tourist vessel	-	1
Kiribati	9	248	42.8	Cargo & Passenger	-	1
	32	1043	58	Cargo & Passenger	-	1
	13	173	36	Cargo	-	1
	8	433	40.96	Special Purpose Only - Dredger	-	1
	-	43.8	20.82	Cargo & Passenger	1	1
	34	401	51.96	Cargo & Passenger	-	1
	8	46	14	Cargo	-	1
	7	20	16.58	Cargo & Passenger	-	1
	37	184	32.64	Cargo	-	1
	8	160	33.37	Cargo & Passenger	-	1

	11	180	40	Cargo & Passenger	-	1
Solomon Islands	31	713	47.1	Cargo	1	1
	26	1001	63.47	Cargo	1	1
	32	851	52.62	Cargo & Passenger	-	1
	33	134	35	Cargo & Passenger	-	1
	31	298	41.5	Cargo & Passenger	-	1
	38	222	24.5	Cargo & Passenger	-	1
Vanuatu	26	1050	54.17	Cargo & Passenger	1	1
	-	258	28.88	Tug Boat	-	1
	-	228	42.86	Cargo & Passenger	-	1
	44	263.9	28.45	Cargo & Passenger	-	1
	-	172	31	Cargo & Passenger	-	1
	-	272.76	-	Tug Boat	-	1
	41	198	31	Cargo & Passenger	1	1
	34	699	57	Cargo & Passenger	1	1
Tuvalu	4	1337	0	Cargo & Passenger	1	1
Samoa	10	1045	46.7	Cargo & Passenger	1	1
	21	993	46.5	Cargo & Passenger	-	1
	24	340	42	Cargo & Passenger	-	-

1.2. Emission calculation and verification

With reference to “Chapter 4” of MARPOL Annex VI, EEDI was introduced as a regulatory instrument for new buildings. The EEDI is an indication value for the hardware of the ship’s design and machinery, applied on new built ship’s after January 2013. However, EEDI could not be calculated because the domestic ships technical information were missing on board the targeted vessels. In some instances calculation are done for the Energy Efficiency Operational Index (EEOI) to give an example.

Verification of fuel consumed by each vessel was barely possible due to various reason. It was also difficult to establish a reasonable EEOI from inaccurate data. Following are some of the issues:

- volume of fuel consumed could not reliably verified because bunker delivery notes were not shared
- Mass of cargo are mostly approximate figures as which could not be verified through either Bill of Ladings or charter voyage quantities or passenger tickets
- Distance covered sometimes were just assumed and repeated for the same voyage
- Fuel oil consumption measurements were conducted with dip sticks or were assumed during refill.

Furthermore, most of the analysis is on bulk fuel volumes for greenhouse emissions i..e. “Carbon Dioxide” (CO₂). CO₂ emissions are directly linked to the amount and type of fuel burnt in internal combustion engines

$$CO_2 Emission = Fuel Consumped \times C_{Fj}$$

Domestic ship operators do not generally wish to have complex data recording. They consider it as time consuming and non-productive on a day-to-day basis. However, we are changing the mindset of the operators to record data as these provide the inputs to efficiency analysis. Only one of the voluntarily vessels had reliable data collection system to establish EEOI for a period. Local government also did not have record of fuel used in the maritime sector thus it was difficult to establish emissions from maritime transport sector.

2. Targeted Countries

2.1. Fiji

For the purpose of emissions calculation, GSS provided bulk fuel oil consumption data of operational vessel for year 2016 & 2017.

2016	CO2 Emission (t)
Vessel 1	578.2
Vessel 2	721.8
Vessel 3	590.3
Vessel 4	93.2
Vessel 5	616.9
Vessel 6	73.4
Vessel 7	139.9

2017	CO2 Emission (t)
Vessel 1	1041.2
Vessel 2	794.7
Vessel 3	447.3
Vessel 4	193.9
Vessel 5	1037.6
Vessel 6	111.2
Vessel 7	118.3

The initial data collection template that was filled by vessel crew were inaccurate and incomplete. Our analysis indicated big gaps in the data and had inconsistent information. Further technical assistance were provided to the shore staff to extract data from an existing reporting system. The alternative to the data collection template was to extract the from the voyage report. Voyage reports are confidential and are only for internal use. The voyage report template captures all the information, however, upon desktop assessments of the reports, it was noted that not all the reports had cargo information filled by the ship master. The excel based programme that already existed with the administration was utilized and data extracts for the vessel movement that consisted of fuel consumption was submitted to MTCC-Pacific.

2.2. Solomon Islands

Only one ship operator provided data after the Solomon Island national workshop. However, the reported fuel oil consumption (FOC) is the summation of fuel consumed during the trip and for cargo operations without a clear differentiation of each operation and in complete. It is the biggest cargo vessel in the Solomon's and is used for outbound transportation of general cargo (goods and building materials) and inbound with copra. The vessel has a single propulsion propeller with bow thrusters

and a shaft power generator is used during steaming. A solar panel has been installed on the top deck for lighting in the bridge only.

The ship operator had only provided data for the period; 27 February – 23 July, 2018 for a fixed route, however the data was only provided for short span due to the change of crew.

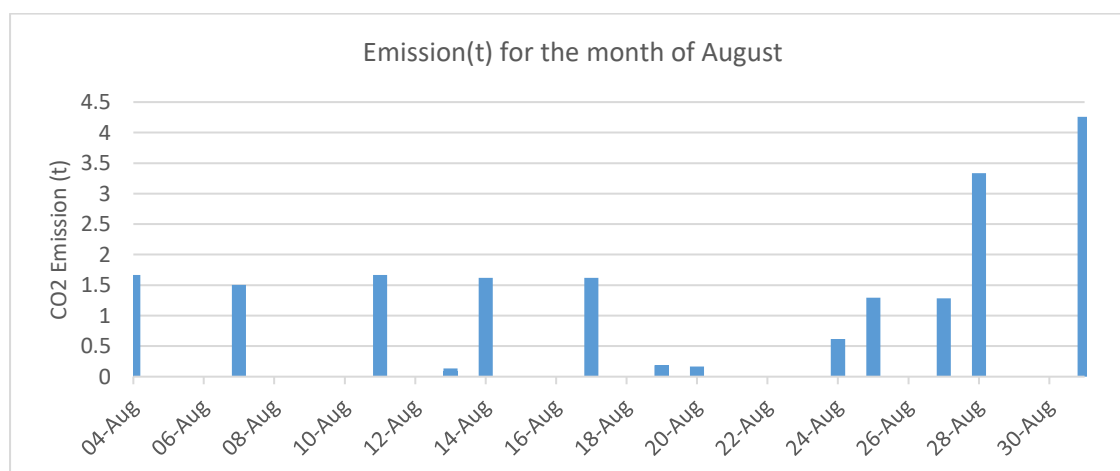
Month	CO2 Emission (t)
Feb-18	2.28
Mar-18	19.80
Apr-18	35.44
May-18	15.47
Jul-18	36.04
Aug-18	19.21

Month	CO2 Emission (t)
Mar-19	35.4
Apr-19	34.9
May-19	3.4

During the end of last year, the ship operator started to acquire a replacement vessel, for which the data were provided for the period; 20 March 2019 – 5 May 2019.

2.3. Kiribati

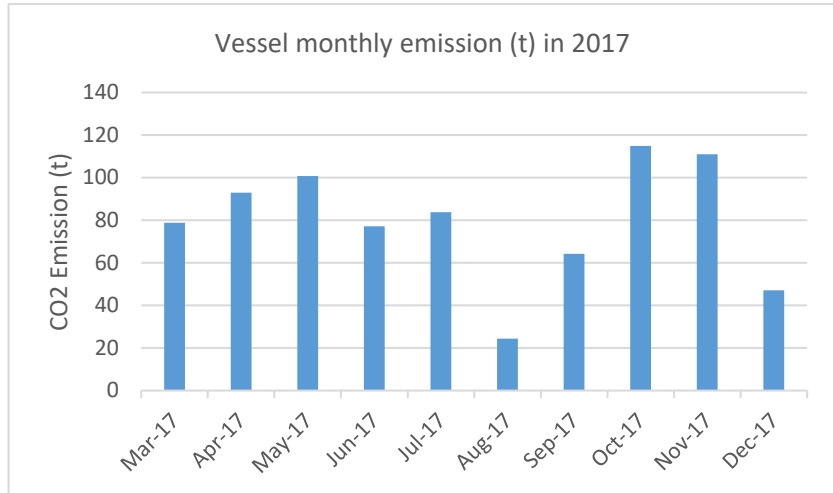
Only one ship operator had provided one set of data for August, 2018 voyages. Illustrated below is a simple quantification of emissions from their operations.



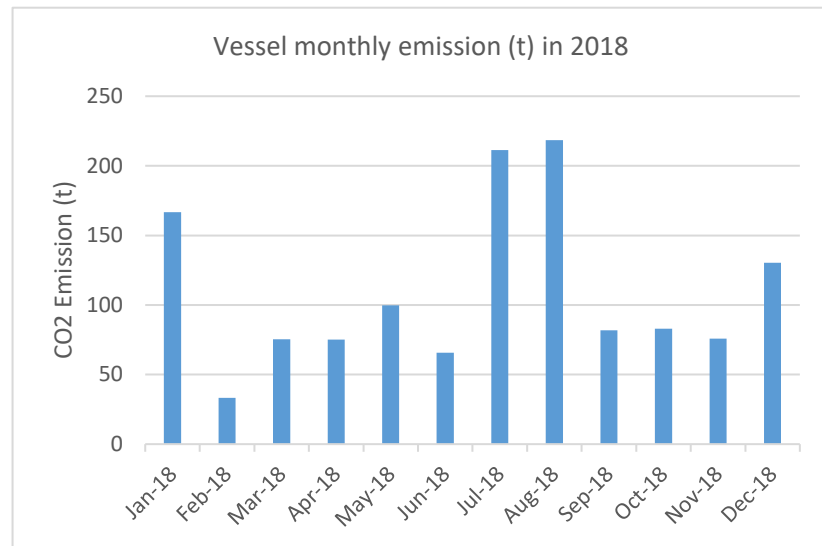
2.4. Tuvalu

The Tuvalu Maritime Department supplied the previous years' FOC data, and the monthly FOC for 2017, 2019 and for few months of 2019. Illustrated below is a simple quantification of emissions from the Tuvalu Government fleet.

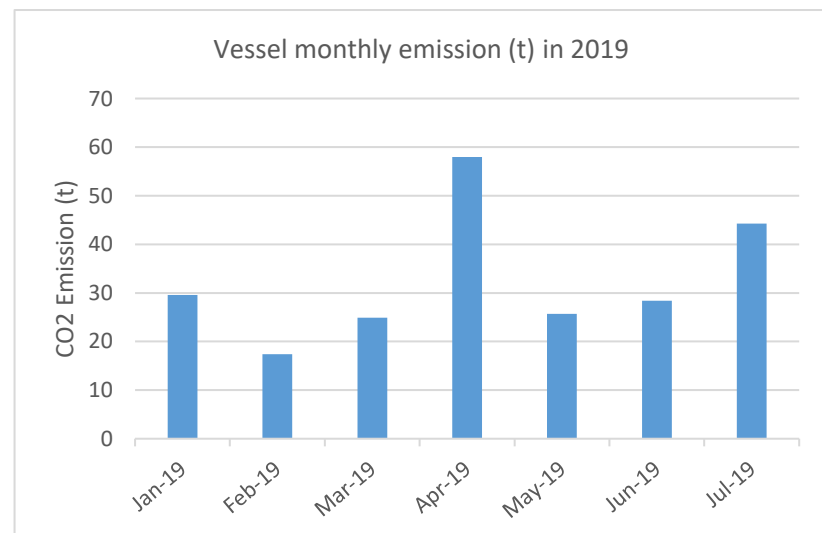
Month	CO2 Emission (t)
Mar-17	78.7
Apr-17	92.9
May-17	100.8
Jun-17	77.2
Jul-17	83.8
Aug-17	24.4
Sep-17	64.2
Oct-17	114.8
Nov-17	110.9
Dec-17	47.0



Month	CO2 Emission (t)
Jan-18	166.7
Feb-18	33.3
Mar-18	75.4
Apr-18	75.0
May-18	99.7
Jun-18	65.7
Jul-18	211.2
Aug-18	218.3
Sep-18	81.6
Oct-18	82.8
Nov-18	75.8
Dec-18	130.3



Month	CO2 Emission (t)
Jan-19	29.60918
Feb-19	17.39847
Mar-19	24.90059
Apr-19	57.97536
May-19	25.68734
Jun-19	28.38488
Jul-19	44.23959



2.5. Samoa

The sole domestic shipping service provider has provided intermittent data over certain periods.

Month	CO2 Emission (t)
Jun-18	40.5
Jul-18	31.4
Aug-18	130.9
Sep-18	33.2

Month	CO2 Emission (t)
Feb-19	73.6
Mar-19	103.8
Apr-19	111.5
May-19	122.0
Jun-19	157.3
Jul-19	156.2
Aug-19	42.6

Given below are some examples of EEOI calculations with correlations to cargo and distance. Other analysis is difference between the inbound and outbound voyages. The EEOI should be a representative value of the energy efficiency of the ship operation over a consistent period which represents the overall trading pattern of the vessel however, it is not possible to establish EEOI for a certain period because of inconsistent data. The EEOI calculation shown below is just for the purpose of indicating the calculations that will be done when fuel oil consumption data would be collected for a period of one year.

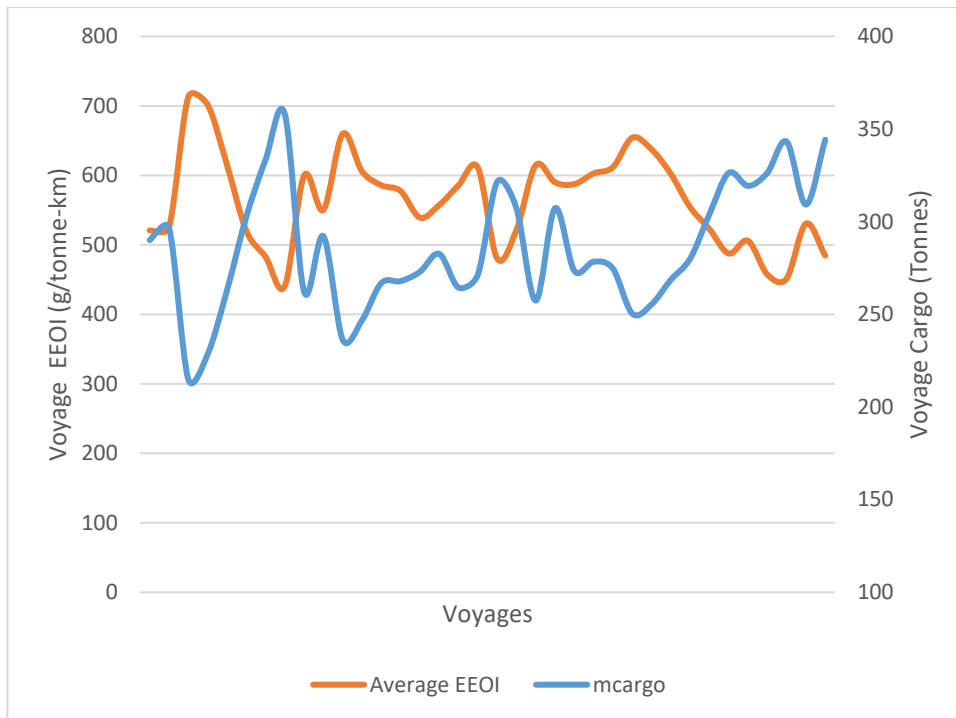


Figure 2-1: Relation between cargo and the average EEOI during the period 16 Jun - 30 Sep 2018.

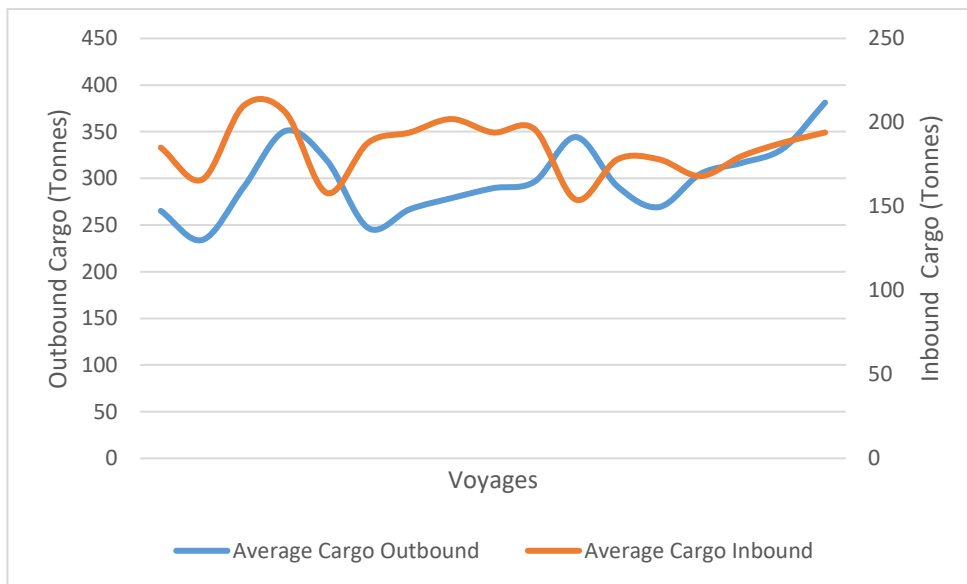


Figure 2-2: Relation between average outbound cargo and the average inbound cargo during the period 16 Jun - 30 Sep 2018.

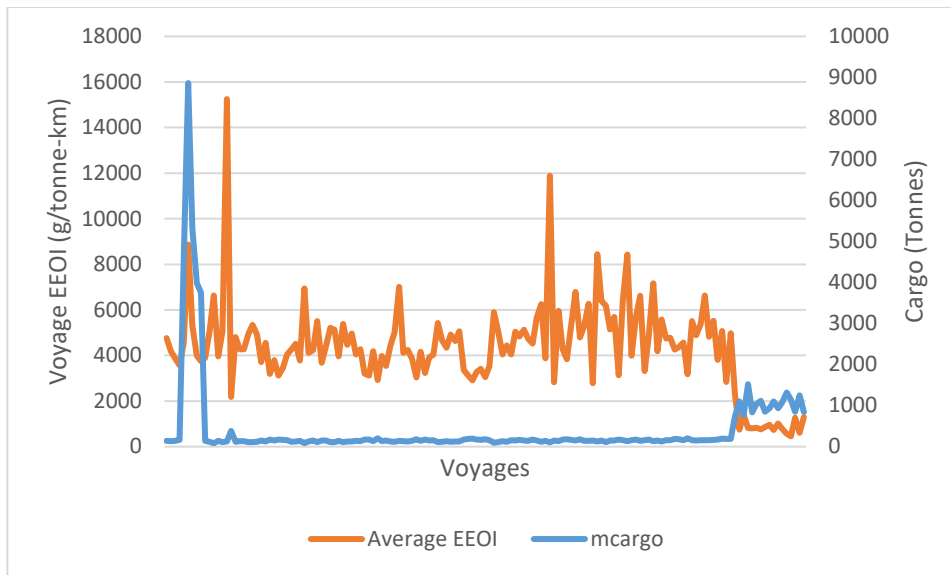


Figure 2-3: Relation between cargo and the average EEOI during the period 4 Feb - 10 Jul 2019.

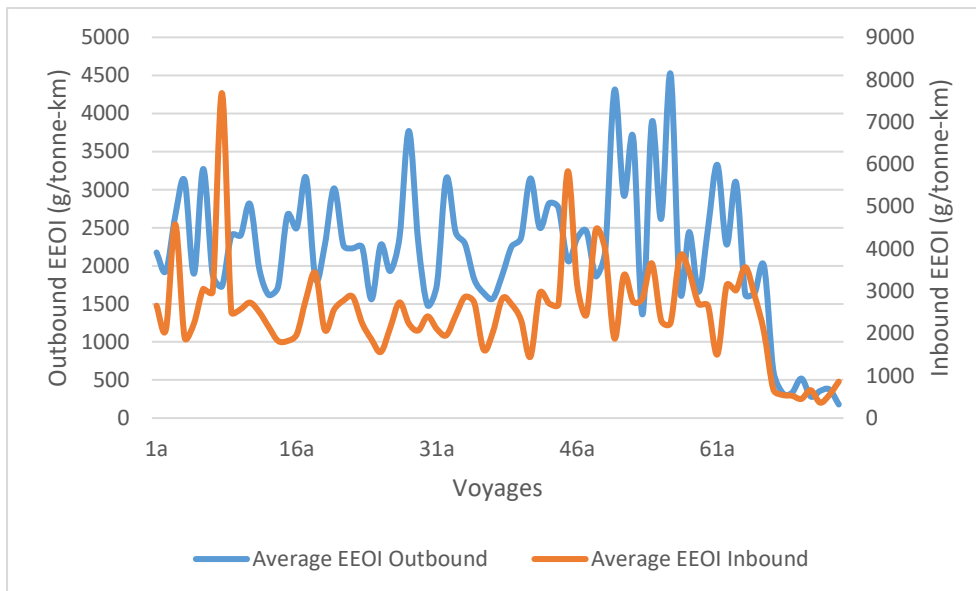


Figure 2-4: Relation between average outbound EEOI and the average inbound EEOI during the period 4 Feb - 10 Jul 2019.

2.6. Vanuatu

2.6.1. Ship Operator 1

Vessel Name: Vessel 1

Month	CO2 Emissions (t)
Apr-18	56.3
May-18	94.2
Jun-18	74.4
Jul-18	10.9
Aug-18	32.0
Sep-18	12.5
Nov-18	10.0
Dec-18	78.2
Jan-19	12.4

Vessel Name: Vessel 2

Month	CO2 Emissions (t)
Aug-18	16.5
Sep-18	134.8
Oct-18	135.7
Nov-18	146.0
Dec-18	145.2
Jan-19	67.3

2.6.2. Ship Operator 2

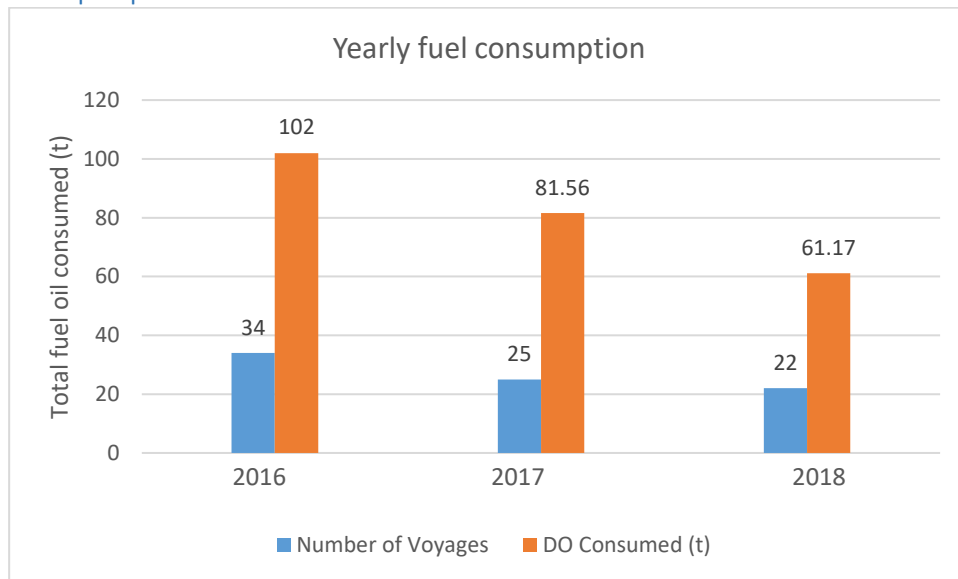


Figure 2-5 - Total fuel oil consumed in previous years by MV Tiwi Trader

Month	CO2 Emissions (t)
Mar-19	16.35
Apr-19	48.4
May-19	30.9
Jun-19	19.3
Jul-19	2.9
Aug-19	29.8
Sep-19	8.3

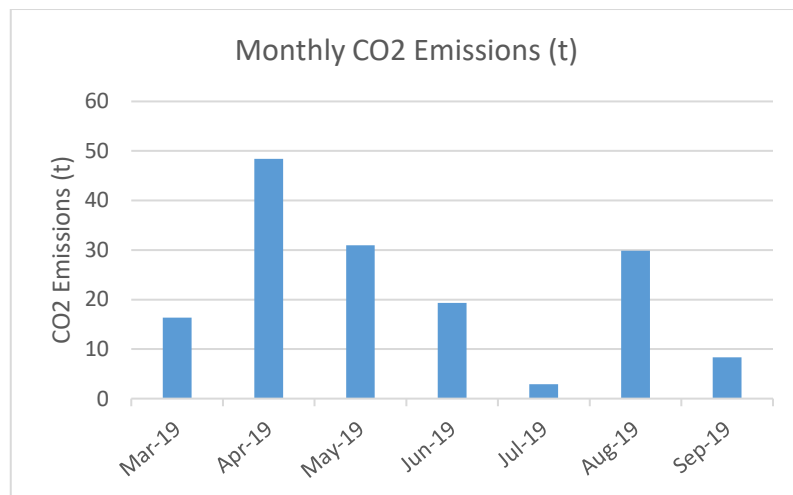


Figure 2-6 – Monthly emission of the vessel

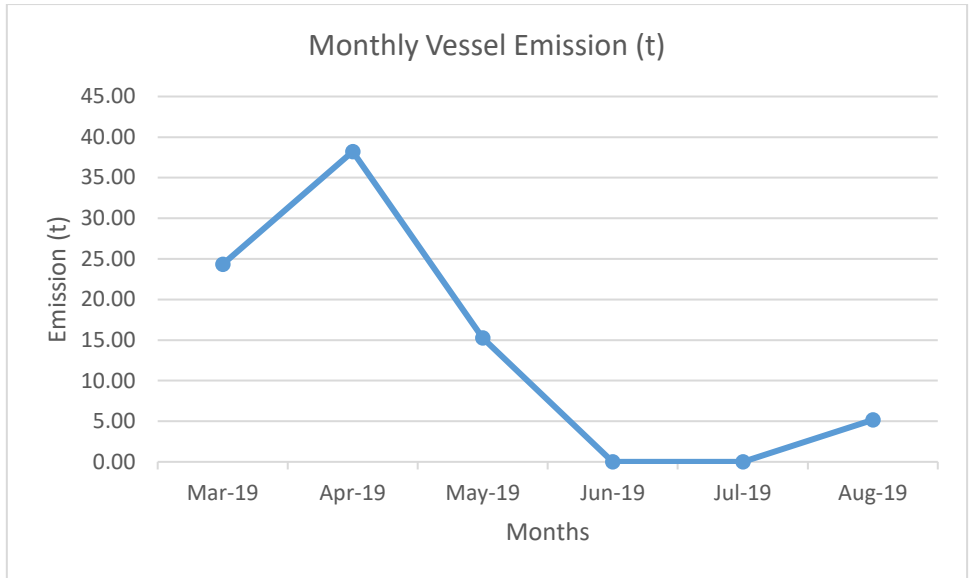


Figure 2-7 - Emission at port/ anchorage

3. Conclusion

In general, the main issue facing this pilot project is the inconsistent data and record keeping by ship operators for key decision making in the implementation of energy efficient measures. Given that fact, it was difficult to carry out verifications, implement analysis standards and techniques. In addition shortage of competent people at the country level (with administration, supplier and ship operator) to assist the project team resulted in challenges for the delivery of the projects. Despite commitment at higher levels, leadership and ownership in the administration and domestic ship operator capacity must be improved.

Generally, data supplied has been incomplete or intermittent despite many owners / operators from government fleets and private companies understanding the importance of baseline data. This was reinforced at the national workshops in the targeted countries, all with collective commitment to data collection at the workshops ('Outcome' documents). In-country technical assistance were provided through PIDSS programme to further built capacity of the ship's crew. Despite knowing that they can reduce greenhouse gas emissions, fuel and costs there has not been a concerted effort by maritime transport public or private sector enterprises to provide data.

Furthermore, MTCC-Pacific activities also have at its core to improve mechanism aiming at raising awareness on safety at sea and introducing, providing and training domestic ship operators and crews on SMS tools which is incorporated with SEEMP. The obligation of SMS and SEEMP in national laws is also one of the first step to engage all ship operators and administration in progressing the uptake of low-carbon technologies on board vessels. Capacity development of staff will also enable the administration to carry out its function as required, in particular technical roles in approving technologies installation but also monitoring projects to uptake new technologies.

Inconsistent data also made it difficult to establish energy efficiency operator index (EEOI) for a vessel for a period. MTCC-Pacific shifted its focus to improve data collection through on board trainings. Similarly, energy efficiency design index (EEDI) could not be calculated due to unavailability of ships technical specifications. However, simple correlation analysis against cargo indicated that there are benefits for the ship operator to reduce its speed on return trips because there is insufficient cargo carried. Unfortunately, in some cases old engine that has already been de-rated for lower speed which cannot safely or economically lower the speed significantly. Also, perverse incentives such as government subsidies/payments for uneconomical routes require goods and passengers to be delivered by certain times no matter how uneconomical that speed maybe. It is of course understandable that both passengers and crew wish to shorten voyages but an awareness raising campaign to justify longer travel times needs to be carried out to show the cost saving benefits.

This has provided opportunity to highlight in the need for MTCC-Pacific to build on the progress and established working relationships with governments and ship/port operators to avoid breaking the momentum that has been created since 2017. However, given the limited budget, the activities will focus on a limited number of countries integrating the requirements for deliverables as per the Contract extension.

Annex 1 – Vessel Visit Photo

Annex 2 – Regulations on Ships Energy Efficiency Data Collection System for their Fuel Oil Consumption 2019