

Pacific Blue Shipping Partnership – Technical Working Group

Technical Working Paper 1: Country Profiles and Fleet data

Purpose of Paper

The Governments of Fiji and Marshall Islands have identified an urgent need for large-scale financial investment to catalyse a multi-country transition to sustainable, resilient, and low carbon shipping. The PBSP targets a domestic shipping transition to zero carbon by 2050 with a 40% reduction by 2030 in a number of Pacific countries¹. This paper summarises known data on Pacific domestic shipping and related GHG emission profiles in the target countries.

Structure of Paper

PBSP is being developed by a Coordination Team co-chaired by Fiji and RMI with PIDF acting as the interim Secretariat. Two working groups, Technical and Finance have been established. The Technical Working Group ToR includes a request for delivery of the following outputs:

- Country profiles including country fleet and shipping industry profiles;
- Analyses that identify and rank potential measures (operational and technological) available internationally for decarbonisation and the Marginal Abatement Cost (MAC) Curves associated with these;
- Review analyses against a Pacific operating scenario to determine: (i) what are the most effective available measures we can take in the target countries now/very near future (and the Marginal Abatement Cost (MAC) Curves associated with these) and (ii) what are the potential measures for Pacific deployment that require research and development (and the Marginal Abatement Cost (MAC) Curves associated with these);
- Assess any additional infrastructure measures (e.g. training, research support, capacity development, financial instruments, policy enablers and manufacturing) needed to support successful deployment of the above measures;
- Development of technical proposals for funding support if and when instructed to do so by the Coordination Team.

This paper addresses the first of these outputs and provides a summary of the countries, including known fleet data and emission profiles from vessels, participating in PBSP. The paper is a work in progress and will be updated as additional information is available. A second paper is being developed to address potential abatement options and their applicability to Pacific country operating scenarios.

Limitations

Accurate domestic maritime data has been consistently identified² as a barrier in the region and remains an on-going challenge for future planning in this sector. Maritime data generally is thin at both country and regional levels and initial emission profiling and modelling has only been attempted thus far for Fiji and RMI. Recent work has seen an accurate baseline established for RMI³. Fiji, Kiribati, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu data are best available information derived from government registers or internet searches. Acquiring better data and analysis and subsequent modelling of abatement potential is an obvious primary step, however, it should not be a constraint to commencing transition work. Sufficient information is available via case studies and extrapolation to allow for first order planning to proceed.

There are distinct country profile differentials consistent with the size, population and economic capacity ranging from Fiji to Tuvalu. Consistent across the range however a number of core commonalities:

- Size – vessels are small with all vessels under 10,000 tonne and most under 1,000 tonne. Vessels under 15m are usually outboard motor powered and make up a significant proportion of all national maritime emissions and fuel profiles.

¹ See PBSP Concept Paper v.2

² ADB (2007); Moon (2013); Nuttall et al (2014), Newell et al (2016).

³ Oxley, M. (2018) *Establishing Baseline Data to Support Sustainable Maritime Transport Services – Final Report TA-8345 REG: Establishment of the Pacific Region Infrastructure Facility Coordination Office*, Asian Development Bank

- Age – there are a larger proportion of older vessels, which allows for consideration of fleet replacement over time.
- Type – all, including vessels under 15m are used in blue water conditions. Amongst larger craft there is a preponderance of landing craft type vessels for moving heavy cargo and multi-purpose passenger/cargo Ro-Ro vessels.

Country Statistics – Overview

	Pop	Land area (km ²)	Sea area (km ²)	# Islands/atolls	# Inhabited	# Boats (>15m)	GDP USD (million)	GDP/Capita USD
Fiji	906,000	18,270	1,290,000	322	110	395 (2016)	5,100	5,400
Kiribati	112,000	810	3,550,000	32 atolls 1 island	21	23 (2018)	197	1,700
Marshall Islands	55,000	181	2,131,000	29 atolls 5 islands	24	25 (2017)	200	3,800
Samoa	196,000	2,935	120,000	9	4	19 (2019)	856	4,360
Solomon Islands	611,000	29,785	1,340,000	992	347	302 (2019)	1,212	1,982
Tonga	108,000	810	700,000	169	36	24 (2019)	427	3,950
Tuvalu	11,000	810	900,000	6 atolls 3 islands	9	4 (2019)	44	3,900
Vanuatu	276,000	12,189	710,000	82	65	243 (2013)	864	3,120

Domestic Shipping Profiles

As a starting point for the identification of potential technology options for the PBSP, both now and in the future, data sources describing shipping activity and ship technical characteristics have been used. Both top down and bottom up approaches have been initiated, using AIS for the former and national and historic case studies for the latter.

Top down using AIS data

The primary source of vessel activity data used internationally is AIS (Automated Information System) data which describes, among others, a ship's identity, position, speed and draught at a given time-stamp. In conjunction with technical specifications of a ship, this data can be used to estimate fuel consumption and emissions. This methodology for estimating fuel consumption and emissions is described in the Third IMO GHG Study 2014. Further information on the underlying dataset and methodology used in this report can be found in ISWG-GHG 3/2/11.

This data, however, has severe limitations and cannot be seen as a substitute for data collection in the region:

- 1) AIS only needs to be fitted on certain ships (i.e. ships of 300 GT and upwards engaged on international voyages, cargo ships of 500 GT and upwards not engaged on international voyages and all passenger ships irrespective of size⁴). This means that many/most of the smaller ships operating domestically or between the 8 countries are not captured.
- 2) The dataset only contains information on 4 ship types: bulk carriers, containerships, oil tankers and general cargo ships, which together represented 68% of total global shipping emissions and accounted

⁴ <http://www.imo.org/en/OurWork/Safety/Navigation/Pages/AIS.aspx>

for 89% of international trade.⁵ However, at the Pacific country level, other ship types might be more important, both in terms of emissions and trade.

3) AIS coverage is imperfect.

With these caveats in mind, 2016 domestic shipping activity by AIS fitted ships, results in the following tables.

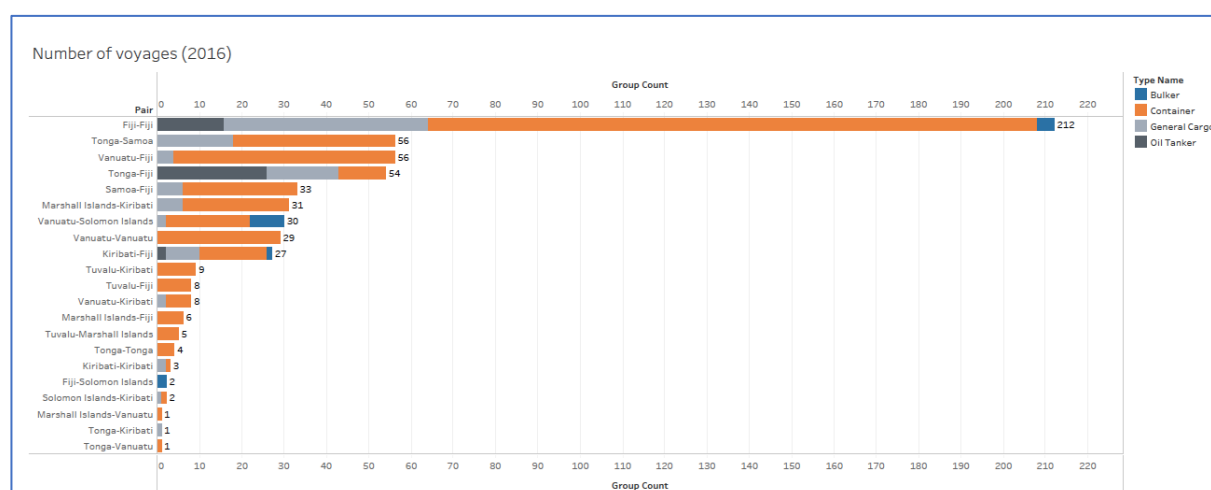
Domestic and Intra-country shipping activity by number of vessels

	Number of voyages	Number of ships	CO ₂ emissions
TOTAL	248	51	12,346
Fiji	212	40	10,817
Vanuatu	29	6	1,034
Tonga	4	2	108
Kiribati	3	3	387
RMI, Samoa, Solomon Islands, Tuvalu	no data	no data	no data

Domestic and intra-country shipping activity by ship type

	No of voyages	No of vessels	CO ₂ emissions (in tonnes)
Bulk carriers	16	13	2,696
Container	572	120	53,652
General cargo	171	58	28,978
Oil tanker	72	13	12,322

Number of Voyages



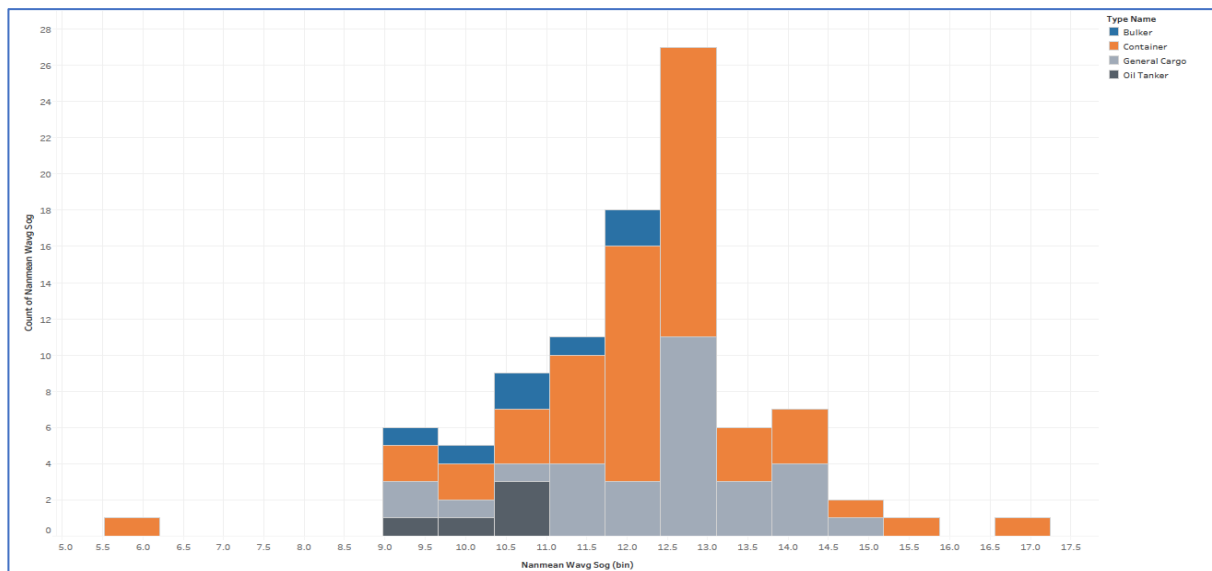
From the AIS data is also possible to construct a range of analyses for this vessel set.

⁵ ISWG-GHG 3/2/11

Average Vessel Speed

Country2	Type Name	Fiji				Kiribati			Marshall Islands			Samoa		Solomon Islands		Tonga			Tuvalu	Vanuatu		
		1	2	3	4	1	2	3	1	2	3	1	3	1	3	1	2	3	1	1	2	3
Fiji	Bulker			10.8				10.5														
	Container	11.7	12.8	13.2		12.4	12.4		12.8			12.2				12.8	11.4		12.5	12.4		
	General Cargo	9.0	11.8	11.5				12.9					13.0					12.9				12.8
	Oil Tanker	10.8			9.5	10.5										10.5						
Kiribati	Container					11.0			11.8	11.8				12.2				13.0	10.4	13.2		
	General Cargo						10.5		12.3	12.7				12.4			14.2				13.0	
Marshall Islands	Container																		12.9			
Samoa	Container															13.2	13.3					
	General Cargo																	13.3				
Solomon Islands	Bulker		12.2																		10.5	
	Container																			11.9	13.3	14.5
	General Cargo																			10.0	12.9	
Tonga	Container															9.4						
Vanuatu	Container								10.0								12.0			10.6		12.3

Speed Histogram by vessel type



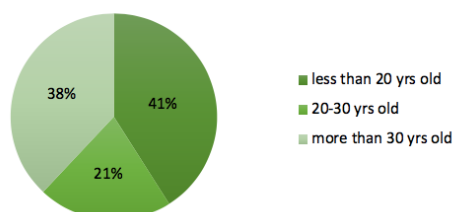
Average Voyage Duration (days)

		Country1							
Country2	Type Name	Fiji	Kiribati	Marshall Islands	Samoa	Solomon Islands	Tonga	Tuvalu	Vanuatu
Fiji	Bulker	0.55	5.33						
	Container	0.50	4.27	5.42	2.33		1.34	2.24	2.02
	General Cargo	5.88	11.34		2.90		1.45		4.01
	Oil Tanker	2.96	10.85				4.71		
Kiribati	Container		6.92	1.49		3.58		2.46	3.81
	General Cargo		9.73	1.42		21.04	4.50		3.50
Marshall Islands	Container							3.65	
Samoa	Container						1.71		
	General Cargo						1.72		
Solomon Islands	Bulker	14.75							4.92
	Container								2.09
	General Cargo								5.30
Tonga	Container						0.60		
Vanuatu	Container			5.96			3.83		0.60

Other Regional Maritime Data

No regional maritime data set of fleet size or composition is currently available to this study. The first regional maritime study by ADB in 2007 noted the chronic data issues existing across the region and it appears little has been achieved in rectifying this since. Searches of the Pacific Data Repository reveal some marginal data of unverifiable quality from the PIGGAREP programme in 2012 for some countries and a single fleet list for Samoa dated 2013. It is unknown what additional data is held by SPC, with the exception of this recent calculation of average vessel ages.

Vessel Age (Kiribati, Fiji, Samoa, Solomon Is, RMI and Vanuatu)



Source: SPC⁶

Domestic Fleet Profiles - Country Level Data

A template for national data collection is suggested below. The domestic fleet includes all ships engaged exclusively in national voyages⁷. In addition, those vessels engaged in national and international voyages operated by a local operator could also be included.

Fleet Information		FIJ	KIR	RMI	SAM	SOL	TON	TUV	VAN
Vessels >15 m (public/private)	type	√	√	√	√	√	√	√	√
	length	√	√	√	√	√	√	√	
	GT	√	√	√	√	√	√	√	
	age	√	√	√	√	√		√	
	main engines	√	√	√		√			
	aux. engines			√					
	voyage data			√				√	
	annual costs			√					
Vessels <15 m	length	√		√					
	eng. power								
Owner operator /	public / private	√	√	√	√	√		√	
	No of vessels	√	√	√	√	√		√	
International ⁸				√	√				

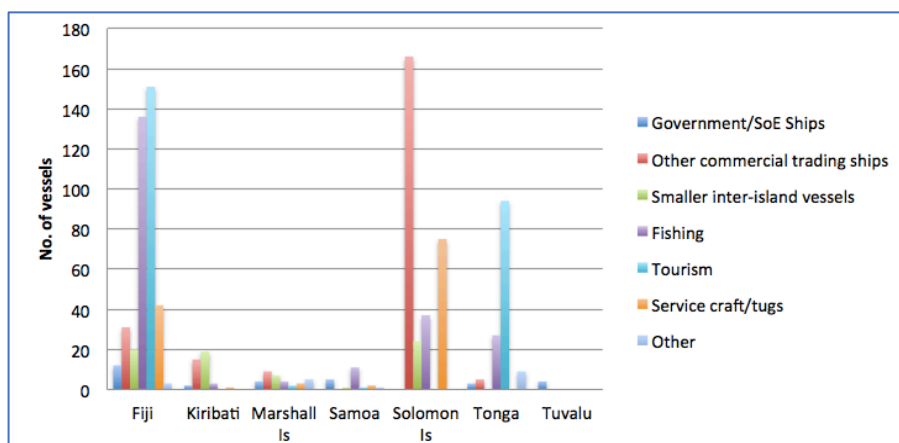
⁶ SPC (2019) Presentation to Pacific Heads of Maritime Meeting, Port Vila, Vanuatu, July 2019

⁷ 2006 IPCC Guidelines for National GHG Inventories Chapter 8 Reporting Guidance

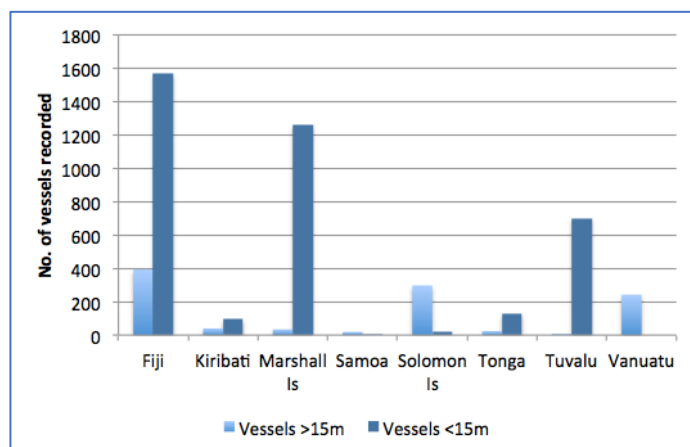
⁸ International vessels are those vessels engaged in international voyages and visiting Pacific Islands Countries ports.

Additional Country Information		FIJ	KIR	RMI	SAM	SOL	TON	TUV	VAN
Hard infrastructure	ports (activities, capacity, energy mgt)	√			√	√	√		
	maintenance facilities (function, location, size, energy mgt)	√			√				
	Other secondary service industry (e.g., engineering, tech/equip providers,	√							
Soft infrastructure	Training/edu/cap develop/MRE	√			√				
	Secondary industry, e.g. data, survey, class	√							
	finance/insurance	√							
	regulatory	√	√	√	√	√	√	√	√
Policy (national plans, regulations, policies on GHG emissions reduction and air pollution)		√		√	√				
Country emissions profiles		√		√					

Pacific Domestic Vessels (>15m)



Pacific Fleet Snapshot

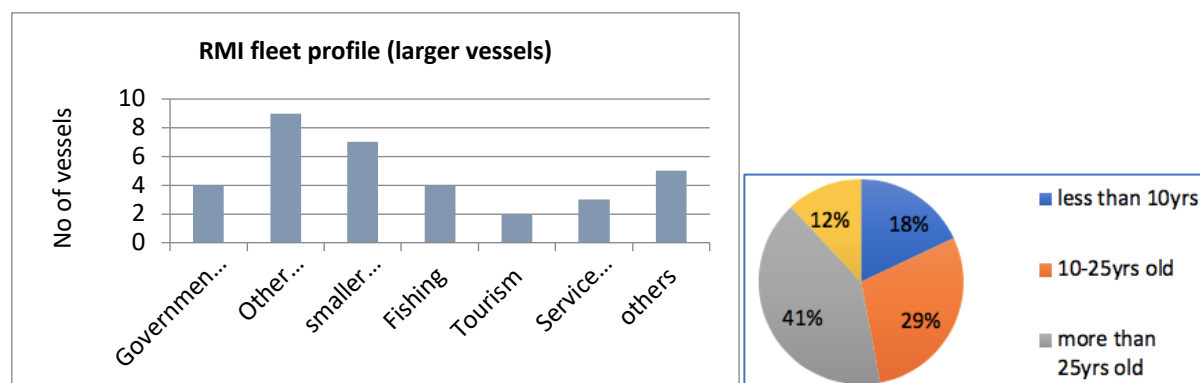


National Summaries

Marshall Islands (2018 data)³

Total registered commercial vessels	34
Total number of vessels >15m	25
Total number of vessels <15m	1,100+ (582 motorized - outboards)

Commercial vessel by type and age (excluding small craft)³



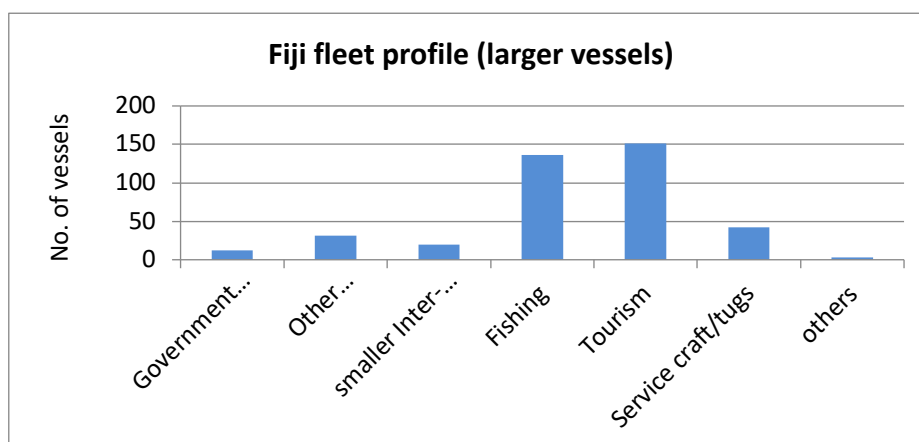
Commercial vessel detail (excluding small craft)

Name	Owner/Operator	Vessel Type	Main Use in FY2017	Year Build	Gross Tonnage	LOA (m)	Number of engines	each at Rated Power (kW)	Rated RPM	Service Speed (kts)	Consumption at Service Speed (l/h)	Main Engines/ Comments
MISC Ships												
mv Kwajalein	MISC	Landing Craft	Field trips	2013	583	45.6	1	478	1500	9.6	95	Yanmar 6RY17W
mv Majuro	MISC	Cargo/ Pax	Charters	2013	416	40.4	2	478	1500	9.5	144	Yanmar 6RY17W
mv Aemman	MISC	Cargo/ Pax	Field trips	2004	409	45.0	1	441	900	8.5	96	Yanmar 6N18A-DV
mv Ribuk Ae	MISC	Cargo/ Pax	Field trips	1996	175	33.5	2	317	1800	8.5	46	Cummins KT19-M
Other Commercial Trading Ships												
LCT Resslerinn	Ms. Resslerinn Latak	Landing Craft	Fuel & Cargo	2007	450	36.5		333		7	95	Cummins NT855 8cyl
mv Lady E	E.U.L.G.	Cargo/ Pax		1966	698	50.3	2	888		9		Caterpillar 2-D398 12 cyl
mv Tobolar	TCPA			1980	315	32.4						One trip only in FY2017
mv Mata	Kaitoi Reimers	Cargo/ Pax	Cargo & Pax	1976	60	19.5	2	333		8.5		Detroit 671 V1271
Melissa K	Pil	Cargo/ Pax	Cargo & Pax	1992	36	16.2		238		8	44	Caterpillar
LC Jerbal	Pil	Landing Craft	Cargo & Pax; projects	1969	108	22.6	2	622		8	61	12v71 Detroit
LC Michelle K	Pil		Cargo & Pax; projects	1994		61.6	2	400		8	113	Caterpillar Cat D3412
mv Jejnicia	Takao Domnick	Fishing/ Cargo		1980	34	17.1						
LCM Chase D	Takao Domnick	Landing Craft		2012	240	28.0						
Small Inter-Atoll Ships												
mv Kuban	Pil	Cargo/ Ferry	Cargo & Pax	2000	5	12.2		260		8	24	Cummins 1/6 inline
mv Lele	Pil	Cargo/ Pax	Charters- Cargo & Pax	1999	7	15.2		260		9	27	Yanmar
Four X	RRE		Cargo & Pax	1972		11.8		407		14.5	55	John Deere inline
Iju in Rak	Mayor Joel Jitiam		Cargo & Pax			14.6		370		10.5	30	GM Detroit 8cyl inline
LC Christina	Robert Pinho	Mini landing craft	Cargo & Pax			9.8	2	111		13		Outboard Yamaha 4
Miko	Mayor Bernard ChongGum		Cargo & Pax			9.8	2	111		17		Outboard Yamaha 4
Tobwe Mili	Kilang Jitiam	LGC boat; cargo & pax				10.7		185		16		Yamaha; only 1 trip in 2017
Fishing Support												
FV Timur	MIMRA	Fishing/ Cargo	Servicing Fish bases	2010	12	13.9		266		14	45	
FV Jebro	MIMRA	Fishing/ Cargo	Servicing Fish bases	2010	12	13.9	1	265		14	45	Sister of Timur
FV Laintok	MIMRA	Fishing/ Cargo		1999	14	16.0						Based in Ebeye
FV Lentanur	MIMRA	Fishing/ Cargo		1999	14	16.6						Based in Ebeye
Tourism												
mv Indies Traders	RRE	Diving/ Survey	Tourism	1978	95	21.3		148		8		
mv Windward	RRE	Diving/ Survey	Tourism; Cargo	1992	202	23.0		222		8		Cummins; Diving Chamber
Service craft/ Tugs												
Tarlan 04	KALGOV'T	Search & Rescue		2015	9	16.6						
MT Ratak II	Pil	TugBoat		1971	282	33.2						
MT Ralik II	Pil	TugBoat		1970	334	33.2						
Not accounted for (but on Register)												
mv. Koba Maron	Anjua Loeak	Non-Commercial		1988	41	23.5						
mv Lae	Lae Local Gov,t	Cargo/ Fishing		1980	64	23.0						
LCM 82	MOPW	Landing Craft		1967	900	38.4						
DeepBlueSea	Heinkey Lomwe	Small IFish Carrier		1996	4	7.7						
mv Barijet	Langmos Hermios	Fishing		1997	12	13.7						

Detailed voyage data sets including fuel and emission accounting are also available for most vessel types.

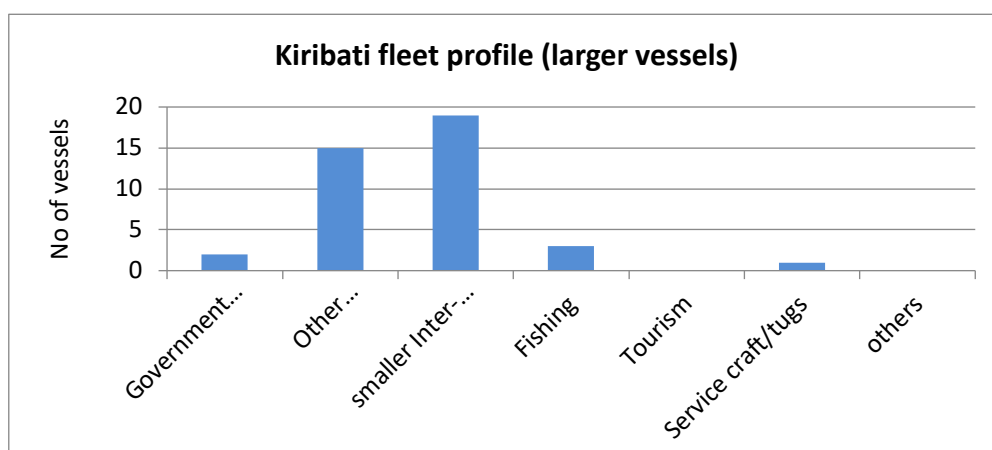
Fiji (2016 data)⁹

Total registered vessels	1970
Total number of vessels >15m	395
Total number of vessels <15m	1575 (motorized - outboards ¹⁰)



Kiribati (2019 data)¹¹

Total registered commercial vessels	41
Total number of vessels >15m	23
Total number of vessels <15m	113 (motorized - outboards)



Samoa Shipping data (2019)¹²

Total registered vessels	21
Total number of vessels >15m	19
Total number of vessels <15m	2
Govt/SoE ¹³ vessels	6
Commercial traders	
Smaller inter-island craft	
Fishing vessels	11

⁹ Maritime Safety Authority of Fiji (2016) Ship Registry

¹⁰ Note that not all outboard motorized vessels are registered or counted, and these are likely to be grossly under-reported

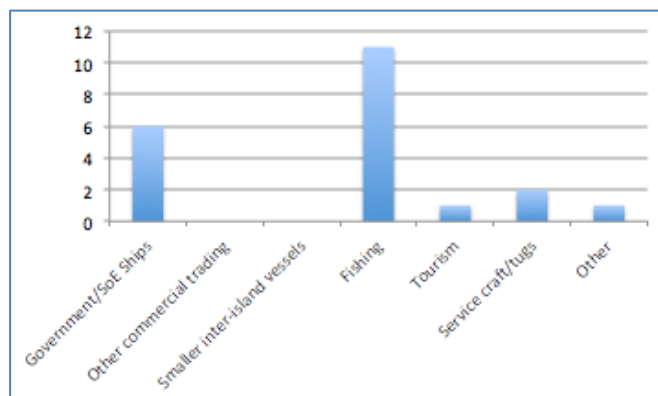
¹¹ Kiribati Government data (2019)

¹² Country Profile Samoa – SPC MTCC (2019)

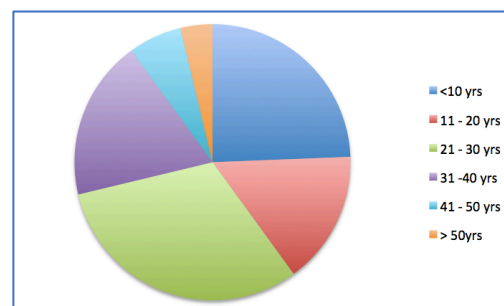
¹³ Samoa Shipping Services Ltd and Samoan Shipping Corporation both set up under Ministry of Public Enterprises.

Tourism	1
Service craft	2
other	1

Samoa fleet profile (larger vessels >8m)



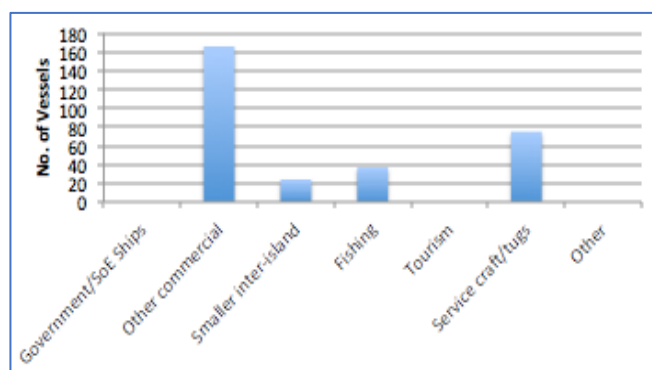
Vessel Age (years)



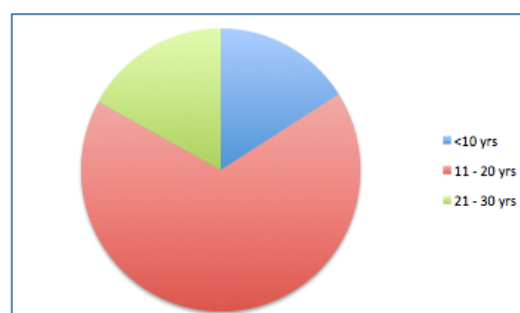
Solomon Islands Shipping data (2019)¹⁴

Total registered commercial vessels	302
Total number of vessels >15m	298
Total number of vessels <15m	22
Govt vessels	0
Commercial traders	166
Smaller inter-island craft	24
Fishing vessels	37
Tourism	0
Service craft	75
other	0

Solomon Islands fleet profile (larger vessels)



Vessel Age (Years)



¹⁴ Solomon Islands Marine Department

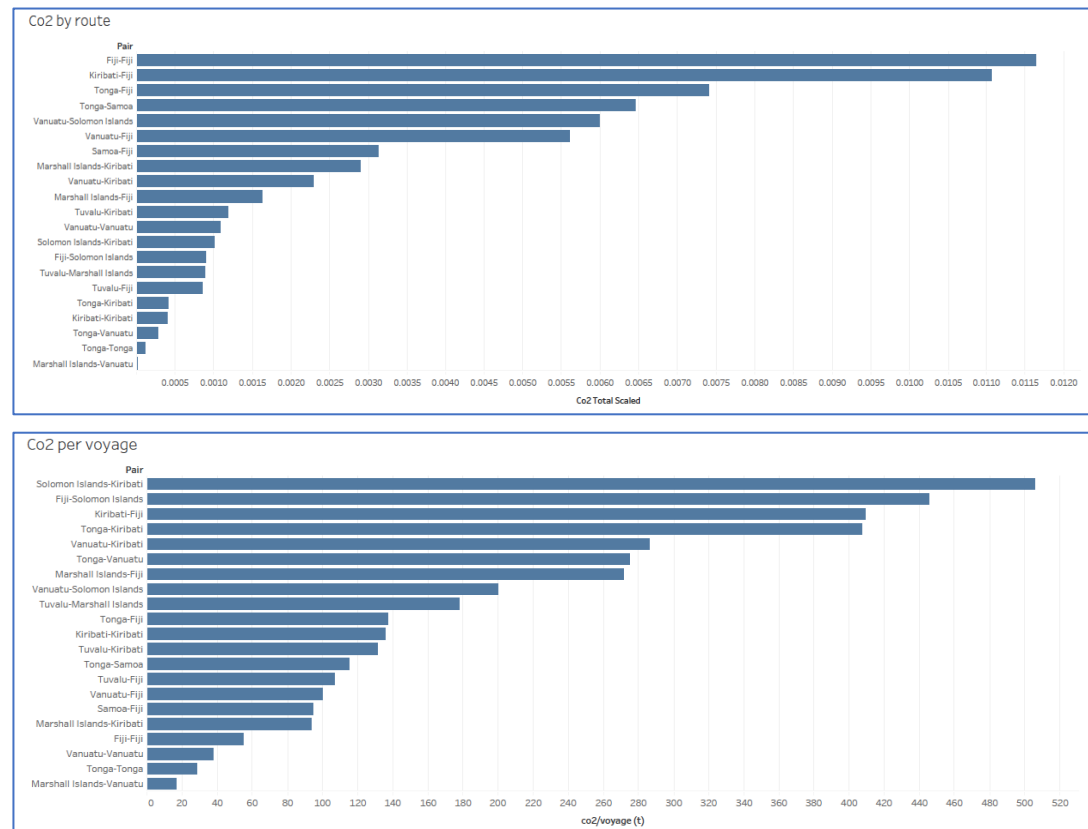
Vanuatu Domestic Shipping data (2013 data)¹⁵

Type of Vessel	Estimated Total	Trade Engaged In	Remarks
All types	243	Passenger, cargo, fishing, tug operations, and pilotage operations	Vessels being registered as domestic operating vessels
Landing Crafts	10	Cargo and Passenger	Engage in Inter-island operations
Flair Bow vessels	54	Cargo and passenger	Engage in Inter-island operations
Other vessels	175	Coastal cargo/passenger transportation	

Calculating Pacific domestic maritime GHG emissions

As with the fleet data discussed above, there are limited data sets available from which to begin calculating Pacific domestic emission profiles. Both top down and bottom up approaches are potentially available. A top-down example is shown, using the AIS data set for selected countries and by four ship types discussed above. This is contrasted with the two known examples of country level calculations for the RMI, using the PRIF 2017 baseline study and from the Fiji 2018 Low Emissions Development Strategy work.

Top down - AIS derived calculations



¹⁵ Battie, JM 2013, Republic of Vanuatu Inter-island and International Shipping Background, Vanuatu Government.



Fiji maritime emissions (2016 data)¹⁶

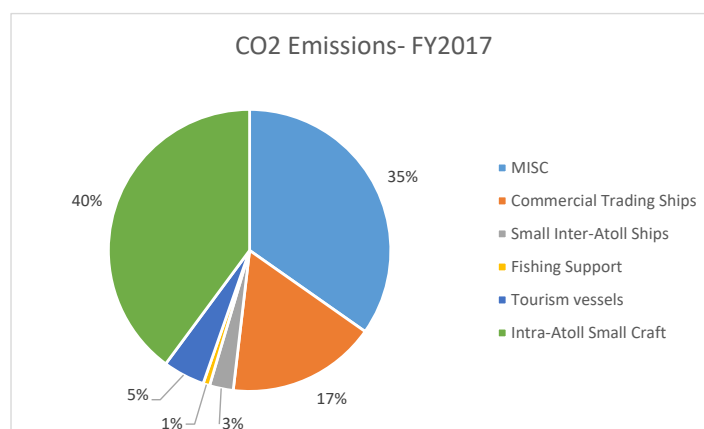
The Fiji assessment was the result of modelling four emissions reduction scenarios for the Fiji Low Emissions Development Strategy (LEDS). The LEDs assessment, in turn, was derived from an ADB commissioned study of available 2016 shipping data which assumed a sector emissions total of 227kt CO₂. There are large errors bars for some ship types, reflecting in adequacies in data, primarily voyage/fuel use data for larger vessels and registry issues for small vessels.

Baseline (2016)	
Sub-sector (based on MSAF categorization)	Emissions (kilotonnes CO ₂)
GSS	3.44
Franchise (uneconomical routes)	3.61
Passenger & cargo (economical routes)	67.12
Fishing (domestic flagged only)	25.37
Tourism	33.59
Small boats (<15m)	21.67
Other	19.18
TOTAL	173.98

¹⁶ Maritime Safety Authority of Fiji (2016) Ship Registry

Marshall Islands vessel fuel consumption and emissions

The PRIF study estimated 2017 domestic shipping emissions at 4,600 tonnes CO₂, and approximated these as 20% of all RMI transport emissions.



Vessel emissions, MISC vessels

