



Status report on sustainable and resilient ports and maritime connectivity in the Pacific region

April 2022



Acknowledgment

The present publication was prepared by the Transport Connectivity and Logistics Section, Transport Division, ESCAP, based on the literature review, dedicated surveys and experts' contributions from Member State experts, particularly those with experience and knowledge of maritime transport in the Pacific region.

The study was led by Mr. Sooyeob Kim, Economic Affairs Officer, Transport Division with study team composed Mr. Sammons Adrian Maurice and Ms. Baker Nicole Frances under the general supervision of Ms. Azhar Jaimurzina Ducrest, Chief of Transport Connectivity and Logistics Section. The study team conducted stakeholder surveys and analysis with the support and cooperation of regional and national experts working on sustainable and resilient port development. Recognition of contributions is also accorded to Mr. Kiwook Chang, Expert on port infrastructure and logistics of Transport Connectivity and Logistics Section, for his technical input to the study. This study report was prepared by ESCAP with financial assistance and technical input from the Korea Maritime Institute. Grateful acknowledgement is also made to the Government of the Republic of Korea, Ministry of Oceans and Fisheries, for the generous funding of this study.

The team gratefully acknowledges the inputs and comments from World Bank Program Leader Ms. Fei Deng and group member Ms. Jenniefer Brawn those who has expertise and experience in the Pacific region, which contributed to the enrichment of this report and which provide a momentum for follow-up studies and projects.

Views expressed in this report are preliminary, sourced from numerous references and do not necessarily reflect those of UNESCAP. Data and related advice provided in this document are also preliminary and not in any way intended for a use as estimates for developments

The designations employed and the presentation of the material in this report do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area of its authorities, or concerning the delimitation of its frontiers or boundaries.

This report has been issued without formal editing.

EXECUTIVE SUMMARY

Following the seventy-sixth session of the Commission dedicated to the theme of sustainable use of oceans, United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) has scaled up its support to regional cooperation on sustainable maritime connectivity, including sustainable port development. Collective actions on greening the shipping and port sector would help the region become a hub for sustainable development, enabling efficient energy use and curbing carbon emissions. Regional exchanges on best practices and lessons learnt will help member States design sustainable and resilient port policies and strengthen sustainable maritime connectivity.

The new regional action Programme for Sustainable Transport Development (2022-2026), adopted by the Fourth Ministerial Conference on Transport (14-17 December 2021) established maritime and inter-regional connectivity as one of its seven thematic areas for further action.

The present report has been prepared as part of the project activities on the Facilitating sustainable and resilient port development to support sustainable maritime connectivity in Asia and the Pacific which aims to assist its member States in planning, developing, and implementing reforms on sustainable and resilient port development, as well as to provide a forum to exchange national experiences and best practices in the design and operations of sustainable and resilient ports.

The results of this work feed into ESCAP's work on regional action programme for sustainable transport development in Asia and the Pacific (2022-2026) and further events designed to formulate regional cooperation framework for sustainable and resilient maritime connectivity.

Legacy issues of Pacific Island ports

Pacific Island ports have legacy issues related to their original site selection and design. Adaptive modernisation has taken place in stages, consisting, firstly, in the evolution to concrete decks and piles, and, secondly, in strengthening of wharf structures, deepening of channels and berth pockets and allocation of yard space to meet the demands of the container revolution. The third stage being confronted in the last decade is port scalability due to the need for further expansion and dealing with the limitations of urban encroachment which existing ports must confront planning for relocation.

Amidst the physical demands imposed on Pacific Island port infrastructure development, the formation of state-owned enterprises occurred, and autonomous port authorities were created as the mandated beneficial owners and operators of the ports. The immediacy to create governance regimes that conformed to national and international legislative compliance was thrust upon these fledgling authorities. Port management, harbour control, ship and port safety, cargo handling, pollution control protocols and labour and contract assignment, and port pricing tariff control were and remain immediate challenges.

Due to limited land availability and small volumes of freight, the designated international port zones are multi-user hosting container storage yards, petroleum storage tanks, cargo warehouses, statutory service buildings (customs, bio security/quarantine immigration) fishing boat wharves and in some instances fish processing facilities, police patrol boat bases and ferry passenger terminals. Land immediately surrounding the port zone is fragmented with mixed usage consisting of waterfront hospitality, retail shops, and markets, sometimes in very close proximity of the port fence line.

Inherent characteristics of Pacific Island ports and maritime connectivity

Pacific island countries (PICs) have small populations, isolated from major trading routes and dispersed over vast distances, with narrow and vulnerable economies and heavy reliance on imports. PIC ports and their maritime connectivity therefore have fundamental characteristics that arise from these conditions including:

- Low trade volumes
- Very long distances between trade partners and global markets
- Low export volumes resulting in high rates of empty container returns
- Smaller, multi-purpose vessels with ship mounted cranes are widely required
- Widely varying port facilities with inadequate funding for operation and maintenance
- Legacy infrastructure designed at times of pre-containerisation

- Lower frequency of shipping services dominated by a few shipping lines
- Lack of redundancy of both shipping services and international port facilities
- High cost of international transport relative to the goods sold
- Vulnerable network easily affected by disruptions
- Natural monopolies in most ports' services, and in many cases, in shipping services.

These characteristics mean that assumptions about the viability and role of ports and connectivity in promoting economic growth do not follow the same logic as they might in other parts of the world. Adjustments to the operating and governance structures need to be carefully considered as wholesale changes can easily destabilise the countries' commercial and structural balance. Pacific island ports are natural monopolies and lack competition with adjacent ports. Pacific island ports have low cargo volumes that only serve natural hinterlands; and occasional transshipment routes that are not located on major shipping networks.

In some sense Pacific Island ports have avoided monopolistic behaviour by limiting exploitation of control and some have allowed private sector participation in cargo handling allowing commercial entrepreneurship. Regulation is needed as well as a staged and careful approach to allowing market competition in such small volume environments. Limited port choices may also inhibit importer/exporter bargaining powers.

The smaller populations, narrow economic base, and remoteness mean PICs face fundamental constraints in terms of:

- Smaller pool of qualified people
- Difficulty financing the construction and maintenance of infrastructure
- Difficulty accessing materials, equipment, and training

Issues in PIC ports and maritime connectivity.

The analysis of the Pacific Island ports, offered in the present report, provides an overview of the ports sector and maritime connectivity with wide ranging examples of the current situation. Thereafter the analysis and evaluation produce a list of considered issues and the value responses for ESCAP to appraise. The key issues in the ports and maritime sector and suggested opportunities for responses are categorised as:

- **Regional network integration and coordination** – including network efficiency, supply chain resilience, and freight costs.
- **Sustainable and resilient ports infrastructure** – including ageing and inadequate infrastructure, the 'build-neglect-rebuild' paradigm, vulnerability to climate change and natural hazards, port design and location and urban encroachment.
- **Border security** – including the challenge of meeting international requirements for port security across multiple dimensions.
- **Domestic connectivity** – including end-of-life boats with high running costs, safety challenges, lack of infrastructure, and low service levels and viability.
- **Port operations** – including difficulties to monitor and fairly compare port productivity, governance and management at ports and a need for a managed approach to investment in digitalisation
- **Financing** – including overly optimistic planning assumptions about economic viability, dependence on aid, limits on borrowing due to high risk of debt distress, undercharging for ports services, and inadequate budgeting for maintenance and repairs.
- **Sector governance** – challenges in sustaining consistent effectiveness in governance over the maritime sector in both administration and operational activities. Strengthening fiscal process management at ports and support for greater private sector involvement in port operations and investments.

- **Legal frameworks** - including coordinated approach for consistent support for rule of law in maritime matters with emphasis upon the need for adoption of appropriate maritime treaties and promptly converting same into national laws.
- **Human resources and capacity** - including a small pool of people, lack of access to training, low management capacity, and low participation of women in the sector.
- **Marine pollution** – including the sensitivity of PICs’ coastal environments and the lack of capacity to prevent or respond to pollution.
- **Safety** – particularly domestic shipping at sea and during loading/unloading

Existing initiatives and support for Pacific ports and maritime connectivity

The Pacific island region is more homogenous than many others in terms of levels of development and political objectives; small domestic markets, dependence on external markets, historical ties with Australia, United States of America (USA), New Zealand (NZ) and Japan, and common threats of climatic change impacts and natural disasters.

Multi-lateral development banks (MDBs) are increasing their consideration of the issues of maritime connectivity and ports in response to; (i) increased overall funding for the region, (ii) increased attention to resilience to climate change and natural disasters, (iii) discourse about the ‘blue economy’ opportunities for Pacific islands, and (iv) increased attention to the opportunities for low-emissions regional shipping due to advocacy from University of the South Pacific (USP), Fiji, Marshall Islands and other countries.

In the last few years, the World Bank and the ADB have provided by far the greatest support for ports and maritime connectivity in PICs with projects totalling around USD 1billion (detailed in the accompanying supplementary document; Project Inventory Report). The Pacific Regional Infrastructure Facility (PRIF) also acts as a coordination and technical assistance agency and aims to help improve the quality and coverage of PIC infrastructure. Bilateral assistance shows that Australia has been the largest provider of development assistance to the Pacific region, followed by the United States of America, China, New Zealand, and Japan. Other regional agencies and forums play roles in supporting the maritime sector and marine environment including Secretariat of the Pacific Regional Environment Programme (SPREP) and The Pacific Community (SPC). These manage the Regional Maritime Programme which provides key services to the sector including hosting support for regional sector associations, development of model legislation, and capacity building to implement international requirements including for seafarer training and port security. Other regional agencies and forums play overarching governance and support roles to PIC governments including the overarching Pacific Islands Forum Secretariat (PIFs).

Possible opportunities for strengthening regional cooperation

As such, much of the advisory responses and support may best be delivered through regional programmes, working with, and strengthening the programmes of existing partners including SPC and SPREP and others identified in this report. Specific opportunities for strengthening regional cooperation, with the support of ESCAP, include medium term priorities responding, in coordination with other donor partners, to the findings of the current study underway by the World Bank – the *Blue Transformation for Maritime Transport in the Pacific*. Identifying country-specific opportunities for support could also be done through SPC’s processes of engaging with countries.

The following areas and opportunities might be worthy of consideration for country specific and regional level support:

- Support the existing regional processes for identification of needs including the World Bank strategy studies, the PRIF coordination processes, and SPC’s work with countries to identify regional priorities.
- Sustainable support for regional professional associations to provide networking, knowledge sharing and have ready access to experts in particular areas including maritime law, corporate governance, enabling private sector participation etc
- Brokering of partnerships and resources for learning exchanges and study tours for staff of ports and government agencies with peer ports in the Asia-Pacific region.

- Technical assistance for: port pricing formula methodology and forecasting trade growth models. Support for a study on freight and port charges, to inform countries on regional comparisons of pricing using a standard unit scale.
- Providing support to help PICs better participate in IMO process related to international GHG emission reduction measures. Support for implementation of international agreements including green port developments that involve ISO accreditation and standards for monitoring and evaluation. Support could extend to creation of a regional Pacific Green port development and accreditation.
- Development of national legislation and compliance arrangements to implement international conventions.
- Governance and institutional development, enabling PPP's and scaled private sector involvement. Support for enabling PICs to review the levels of private sector investment in supply of port and maritime services.
- Asset management planning including preventative maintenance and renewals budgeting processes, and asset management plans. This technical assistance could be introduced as a regional campaign using a standard approach.
- Support for Pacific Women in Maritime Association (PacWIMA) training, exchanges, and mentoring to build women's leadership in the maritime sector and contribute to more adaptable maritime organisations in the Pacific. Align with traditional Pacific Islands culture (e.g., Fakaleiti or Fa'afafine peoples in Tonga and Samoa respectively to offer opportunities for employment inclusion by the LGBTQ community.

These opportunities and areas of support are detailed in the body of the report where the issues are explained with examples in the maritime setting and potential responses summarised, see Section 2. The possible opportunities for ESCAP support are further detailed in Section 6 along with existing processes for identifying initiatives and programs.

Table of Contents

EXECUTIVE SUMMARY	3
Table of Contents	7
1 INTRODUCTION	11
1.1 Purpose and Scope	11
1.2 Structure of this Report	11
2 OVERVIEW OF MARITIME CONNECTIVITY AND PORTS IN THE PACIFIC	12
2.1 Inherent Characteristics of Maritime Connectivity in Pacific Island countries (PICs)	12
2.2 History of Shipping and Ports in PICs	13
2.3 International Shipping	19
2.4 International Freight	23
2.5 Ports in Pacific Island Countries	26
2.6 Domestic connectivity	36
3 KEY ISSUES FOR MARITIME CONNECTIVITY AND THE SUSTAINABILITY OF PORTS IN PACIFIC ISLANDS	39
3.1 Regional network integration and coordination	39
3.2 Sustainable and resilient ports infrastructure	41
3.3 Border security	45
3.4 Domestic connectivity	46
3.5 Port operations	48
3.6 Financing	49
3.7 Sector governance	51
3.8 Legal frameworks	53
3.9 Human resources and capacity	55
3.10 Marine pollution	56
4 KEY ACTORS, AGENCIES AND PROGRAMMES IN PACIFIC PORTS AND MARITIME CONNECTIVITY	58
4.1 Overview	58
4.2 Multilateral development banks (MDBs)	58
4.3 Bilateral development partners	60
4.4 Regional agencies and programmes	61
4.5 United Nations agencies	64
4.6 Maritime training institutes	64
4.7 Port managers	64
5 INVENTORY OF DEVELOPMENT PARTNER-FINANCED PROJECTS IN PICS - SUMMARY	65
6 IDENTIFYING OPPORTUNITIES FOR FURTHER ATTENTION	74
6.1 General	74
6.2 Existing processes for identifying initiatives and programs	74
6.3 Potential specific opportunities for ESCAP	76
7 BIBLIOGRAPHY	78

TABLE OF FIGURES

Figure 1 - Hōkūleʻa ((Polynesian Voyaging Society, 2021)	13
Figure 2 - Levuka Port, Fiji Circa 1850.....	14
Figure 3 – Suva Harbour, Fiji Circa 1910 (FPCL, 2020)	14
Figure 4 - Typical Pacific Class Freighter Circa 1955 (ASL, 2021)	15
Figure 5 - Lautoka Port, Fiji; Ship Handling Conventional Cargoes Circa 1950 (FPCL, 2020)	16
Figure 6 – MV Hawaiian Merchant 1958 at Honolulu Port (Matson Line, 2021)	16
Figure 7 - Multipurpose Container Ship at Apia Port Samoa (AMSTEC Pty Ltd, 2016)	17
Figure 8 - Warehouses on Wharf Deck at Lautoka Port 2017 (AMSTEC Pty Ltd, 2016).....	18
Figure 9 - Typical Multi-Purpose Container Ship at Port Vila, Vanuatu (courtesy of AMSTEC Pty Ltd)	19
Figure 10 - Container Shipping Route Density Map 2019 (Marine Traffic , 2019).....	21
Figure 11 - Total TEU Volume Chart PIC's 2010 – 2018 (UNCTAD, 2021)	24
Figure 12 - Total TEU Volumes Visualization Chart 2018 (Authors construct – UNCTAD data).....	25
Figure 13 – Multi-Purpose Container Ship and Fisheries Fleet at Pohnpei Port, FSM (AMSTEC Pty Ltd)	27
Figure 14 – Apia port, International Terminal Multi Users Port (JICA 2018)	27
Figure 15 - Lapetasi Port Terminal Port Vila, Vanuatu (AMSTEC Pty Ltd).....	28
Figure 16 - Container Transshipment Activity at Suva Port (AMSTEC Pty Ltd).....	29
Figure 17 - Cruise Ship at Main Wharf in Port Vila - Lapetasi Terminal in background (P&O Cruises Aust).....	30
Figure 18 - Fisheries Transshipment at Anchorage in FSM (AMSTEC Pty Ltd)	31
Figure 19 - Average Vessel Turnaround Time by Type of Ship, 2019-2020	32
Figure 20 – Ports tariffs in Vanuatu, Tonga, Fiji, Cook Is, and Kiribati 2021 (PRIF, 2021).....	33
Figure 21 - Lapetasi Wharf and Terminal Port Vila, Vanuatu 2018 (VPMU, 2018)	34
Figure 22 - Vaiusu Bay Port Development Project CHEC / SC Group 2016	35
Figure 23 - Typical Purpose-Built Passenger Ferry Samoa 2016 (AMSTEC Pty Ltd)	36
Figure 24 - Typical Franchise Shipping Vessel Vanuatu 2018 (AMSTEC Pty Ltd)	37
Figure 25 - MV Taimareho 1 at Honiara Port prior to departure (AMSTEC Pty Ltd 2019).....	38

TABLE OF TABLES

Table 1 - Profiles of Main Shipping Lines Operating in the Pacific (Annual reports – SX searches)	20
Table 2 - Main Pacific island shipping routes by shipping line (Source: Shipping line schedules)	22
Table 3 – Total TEU Volume Statistics at PIC Ports 2010 – 2018 (UNCTAD, 2021)	24
Table 4 - OECD PIC Trade Facilitation Scores 2019	26
Table 5 – Summary of major international port-related infrastructure projects in PICs.....	65
Table 6 – Summary of major domestic connectivity-related projects.....	68

ABBREVIATIONS

ADB	Asian Development Bank
AIFFP	Australian Infrastructure Financing Facility for the Pacific
CPSC	Central Pacific Shipping Commission
DFAT	Australian Department of Foreign Affairs and Trade
DWT	Deadweight tonnes
FSM	Federated States of Micronesia
FSS	Franchise Shipping Scheme
IMO	International Maritime Organization
ISPS	International Shipping and Ports Security
JICA	Japan International Cooperation Agency
M	Metre
MARPOL	International Convention for the Prevention of Pollution from Ships
MDB	Multilateral Development Bank
MFAT	New Zealand Ministry of Foreign Affairs and Trade
MSC	Micronesian Shipping Commission
MTCC-Pacific	Maritime Technology Cooperation Centre in the Pacific
MV	Motor vessel
NZ	New Zealand
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
PacMA	Pacific Islands Maritime Association
PacWIMA	Pacific Women in Maritime Association
PBSP	Pacific Blue Shipping Partnership
PIC	Pacific island country
PIDSS	Pacific Islands Domestic Ship Safety Programme
PIFS	Pacific Islands Forum Secretariat
PIMLA	Pacific International Maritime Law Association
PISA	Pacific Islands Shipowners Association
PMTA	Pacific Maritime Transport Alliance
PRIF	Pacific Region Infrastructure Facility
PSDI	Pacific Private Sector Development Initiative
RMI	Republic of the Marshall Islands
RNZ	Radio New Zealand
SPC	The Pacific Community
SPREP	Secretariat of the Pacific Regional Environment Programme
SV	Sailing vessel
UNCTAD	United Nations Conference on Trade and Development
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
USA	United States of America
WB	The World Bank Group

NOTES

In this report;

- "\$" refers to US dollars, unless otherwise stated.
- Date format is DD/MM/YYYY, unless otherwise stated.
- Metric measures are used, unless otherwise stated.
- References are listed in a bibliography using the APA citation format.

1 INTRODUCTION

1.1 Purpose and Scope

Following the seventy-sixth session of the Commission dedicated to the theme of sustainable use of oceans, United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) has scaled up its support to regional cooperation on sustainable maritime connectivity, including sustainable port development. Collective actions on greening the shipping and port sector would help the region become a hub for sustainable development, enabling efficient energy use and curbing carbon emissions. Regional exchanges on best practices and lessons learnt will help member States design sustainable and resilient port policies and strengthen sustainable maritime connectivity.

The new regional action Programme for Sustainable Transport Development (2022-2026), adopted by the Fourth Ministerial Conference on Transport (14-17 December 2021) established maritime and inter-regional connectivity as one of its seven thematic areas for further action.

This report sets out to:

- analyse the current status and issues related to sustainable and resilient port development in the Pacific region
- identify possible initiatives necessary for sustainable and resilient port development and sustainable maritime connectivity in the region
- highlight areas of opportunity where further attention may be required.

The focus is on international ports and how they facilitate international and domestic connectivity. The issues considered range from system planning to infrastructure planning to financing, and from capacity of national institutions to the need for better regional coordination mechanisms. The report takes an overview of the region, with an inventory of relevant major projects across the 13 countries of Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu. While this report is offering a preliminary analysis, the World Bank is undertaking a comprehensive analytical study of maritime connectivity in the Pacific islands under the *Blue Transformation for Maritime Transport in the Pacific* project, which work will be available in the first half of 2022 and will provide further insights, direction and details.

When talking about ‘the Pacific islands’ this report is referring to the region known variously as the Pacific islands, the Southwest Pacific or Melanesia, Micronesia, and Polynesia, excluding Papua New Guinea. It does not include non-sovereign territories like New Caledonia and excludes Australian, New Zealand, French and US Island states and territories such as Norfolk Island, Chatham Islands, Tahiti, Hawaii, Guam, and American Samoa.

1.2 Structure of this Report

Section 2 provides a description of inherent characteristics of PICs that determine some aspects of ports and maritime connectivity in Pacific islands. It then gives a brief overview of the history and current situation for Pacific Island ports and maritime connectivity, before describing the major trends and drivers for change.

Section 3 sets out the issues around ports and maritime connectivity in the Pacific and provides a high-level assessment of the current situation – this highlights the key areas where support is needed across the Pacific.

Section 4 sets out the key actors in the region including regional organisations, multilateral development partners, bilateral partners, and a general view of national institutional arrangements.

Section 5 presents an inventory of major regional and country-specific projects.

Section 6 summarises the findings including identifying possible areas where there may be opportunities to support PICs in sustainable ports and maritime connectivity.

2 OVERVIEW OF MARITIME CONNECTIVITY AND PORTS IN THE PACIFIC

Pacific islands have been characterised as being small and remote. This definition may lead to undervaluing their vast oceanic exclusive economic zones and their wealth of traditions and community values which underpin their society and global recognition as peaceful and resilient peoples. Respect is one of the central concepts in island culture which is demonstrated through family and community life

The “islandness”, smallness and remoteness of the Pacific Island countries has hindered their economic development in the world economy. Their smallness constitutes a major constraint in that the limited land available for agricultural activities produces little for local consumption and sale to the domestic and export markets. The remote location of the Pacific Island countries from the international markets results in high transportation costs for exports, and high distribution and marketing costs. This results in Pacific Island exporters becoming mainly price takers in the international markets, (UNCTAD, 2013).

2.1 Inherent Characteristics of Maritime Connectivity in Pacific Island countries (PICs)

The Pacific islands shipping trade routes are typified by narrow economic bases that translate to low trade volumes, are long distances to major trade partners and global markets, have a dependency upon on imports for basic merchandise trade including fuels, construction materials, motor vehicles and foodstuffs.

These factors – small population, isolated and dispersed, with a narrow and vulnerable economies (ADB, 2021), and their heavy reliance on imports – create the fundamental character of PIC ports and maritime connectivity which includes:

- **Low trade volumes** – cargo in Oceania is less than 0.2% of the total global shipping cargo (UNCTAD, 2021).
- **Very long distances between trade partners and global markets** – e.g., Nuku’alofa to Singapore is 9,450 kms, Suva to Los Angeles is 9,000 kms and Tarawa to Auckland is 4,300 kms (Netpas Distance, 2021).
- **Low export volumes resulting in high rates of empty container returns** – e.g., the ratio of full container imports and full container exports is 25:2 for the Port of Tarawa, Kiribati (Prince & Mackeen, 2017).
- **Smaller, multi-purpose vessels with ship mounted cranes** – scaled according to the volume and type of cargo, and smaller facilities with no shore cranes at most Pacific ports (PRIF, 2021).
- **Widely varying port facilities with inadequate funding for operation and maintenance** (ADB, 2007).
- **Lower frequency of shipping services** – e.g., at the lower end of the range, Funafuti port, Tuvalu received only 16 direct calls of international container ships in 2019 (NPDL, 2021).
- **Lack of redundancy of both shipping services and port facilities** – in many Pacific Island ports there is only one international port with sufficient capacity (wharf length, depth of water in channels and alongside berth) to allow international ships to direct call (PRIF, 2021).
- **High cost of transport relative to the goods sold** (ADB, 2007).
- **Vulnerable network easily affected by disruption** – PIC ports and shipping can be severely affected by a range of issues including natural disasters, a pandemic, or macroeconomic or supply chain shocks including fuel prices.
- **Natural monopolies in most port services, and in many cases, in shipping services** – a condition of the smaller scale of available cargo volumes that do not support, in many cases, more than a single supplier of services.

The small populations, narrow economic base, and remoteness mean PICs also face fundamental constraints in terms of:

- **Smaller pool of qualified people** – from a smaller, dispersed population and distance from education opportunities, as well as increasing outmigration in many PICs.

- **Difficulty financing the construction and maintenance of infrastructure** – due to the narrow economic base, dependence on aid, and higher cost of imported materials, equipment, and expertise.
- **Difficulty accessing materials, equipment, and training** – due to the small, remote market and the need to import most things.

Importantly, the conditions leading to these characteristics of most PIC ports cannot be changed – they are a fundamental consequence of the unique geography and resource base of the PICs. It is helpful to understand these inherent characteristics of PICs, and therefore of the Pacific islands region shipping and ports sector, as the context for all development work around maritime connectivity in the Pacific. The issues in the sector arise from these inherent conditions are discussed in more detail in Section 3.

These foundation conditions contrast starkly with the situation for larger ports around the Pacific rim in countries with large populations, close proximity to multiple trading partners, and rapidly growing, broad-based economies. The design parameters for the development of ports and maritime connectivity in PICs are therefore very different, the same assumptions do not hold, and solutions must be appropriate and fit for purpose.

The following sections set out some of the history of development of ports and shipping in PICs.

2.2 History of Shipping and Ports in PICs

2.2.1 Early Pacific Island Seafaring

Pacific islanders have an exceptional maritime tradition using non-instrument navigation extending centuries before colonisation of Pacific Island nations in the 17th-18th centuries. Voyages in robust sailing canoes covering across vast ocean distances were frequently undertaken in the pursuit of cultural and exploration needs. Genetic “founder effects” in modern Pacific islanders reveal that 4,000 - 5,000 years ago, a group departed Chinese Taipei and began the multi-millennium journey across the Pacific Ocean settling in Micronesia and Melanesia. Genetic mapping shows Samoa was settled starting around 830 A.D followed by the Cook Islands and the Tōtaiete mā Islands by the 11th century, (BDG Science Media, 2021).

This heritage of seafaring remains strong with the tradition of oceanic voyages enjoying a renaissance. Techniques of traditional ocean-going canoe building is being revitalised with enthusiasm marked with modern day voyages undertaken to retain and demonstrate cultural significance of these skills. An example if such is the 2014-17 global circumnavigation in the Hōkūle‘a Pacific canoe, (Schiffman, 2017), See Figure 1.

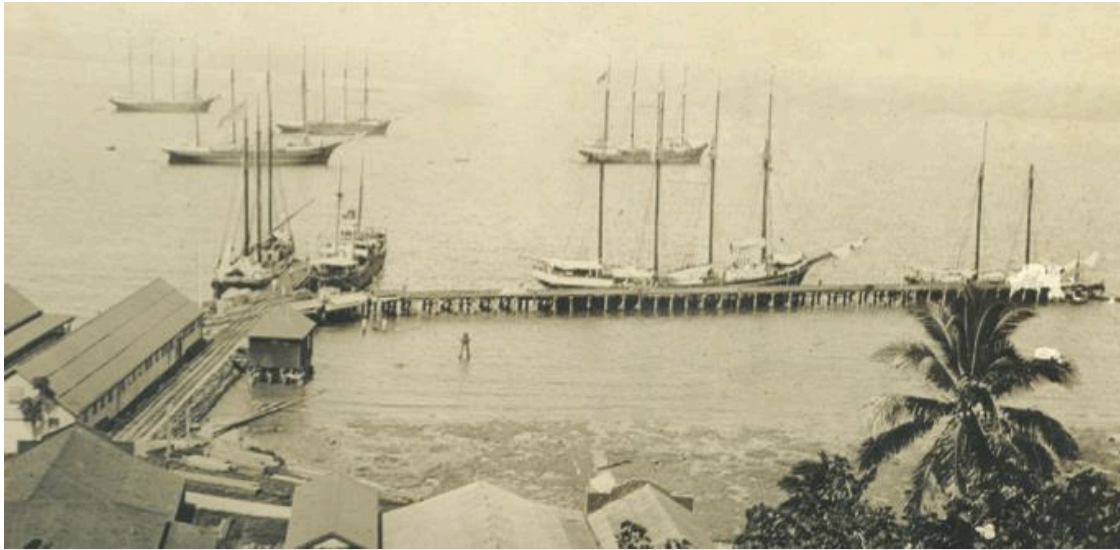
Figure 1 - Hōkūle‘a (Polynesian Voyaging Society, 2021)



2.2.2 Colonization Trade

The periods of early Pacific island colonisation involved Christian missionary settlements and trade in the 1780-90's. Exploitation of natural resources attracted European settlers, who engaged in sealing, sandalwood forestry, pearling and early forms of livestock farming in many Pacific islands which were supported by sail ship connections with Europe, Australia/New Zealand and the Americas. It was not until the 1810-40's that permanent ports were developed driven by the growth in commercial cargo volumes. Towns supporting resident trading communities and maritime trade expanded, notably in Papeete in Tahiti, Apia in Samoa, and Levuka in Fiji which became centres for European traders, (EB, 2021) and original capitals of their nations, see Figure 2.

Figure 2 - Levuka Port, Fiji Circa 1850



2.2.3 Steamship Arrival 1900's

Transition from sailing ships to steamships evolved from the 1840's with the invention of the screw propeller and metal hulls. Sailing ships were still useful in the 19th century, in part because they were cheap to build and run and they were important in inter-island Pacific trade (did not require deep harbours or channels), (Halter, 2021). Constrained by the wind and seasonal weather variations, prompt arrival at port was never guaranteed, though sailing ships did follow predictable paths in the Pacific to try and maximise efficiency, see Figure 3. Widespread use of steamships in the Australian and Pacific colonies from the 1850-60's motivated by the Australian gold rush, railway constructions and the opening of the Suez and Panama Canals (1869 and 1914).

Figure 3 – Suva Harbour, Fiji Circa 1910 (FPCL, 2020)



European government intervention in Pacific island colonies in the 1880-90's marked the transformation to protectorate and annexed states notable by Britain, France and Germany and later by the United States of America. The patterns of colonial rule in Pacific islands altered by the end of 1918 to what can be described as stable until WWII. The fluctuations in world markets for copra, sugar, and other products sourced from Pacific islands in the 1920-30's drove improvements in ports and shipping connectivity. This era was pre-scheduled airline routes to the Pacific thus shipping catered to freight and passengers which meant port capacity had to provide services for regular passenger reception facilities.

In 1950, the world economy was still recovering from the effects of World War II, and this was reflected in the composition of the world merchant fleet dominated by the 10,000 tonne Liberty ship. These merchant ships were the workhorse of post war trade, based on a British design built in the United States to enable the United States/United Kingdom to meet the demand for war materials.

By the 1950-60's there were several established trading and shipping firms in the Pacific. The dominant steamship lines included Burns Philp (South Sea) Company, Australasian United Steam Navigation Company (AUSN), Union Steamship Co(USSCo) of New Zealand, German company Norddeutscher Lloyd, Dutch-owned Koninklijke Paketvaart-Maatschappij, British India Steam Navigation Company; and the British Peninsular and Oriental Steam Navigation Company (P&O). Other smaller ships plied the Pacific waters, owned by trading companies such as Lever Brothers, W.R. Carpenter & Company, and the Colonial Sugar Refinery, as well as other ships that were directed by Christian missions, such as the John Williams and Southern Cross fleets, (Halter, 2021).

2.2.4 Port Rebuilds 1950-60's

In the 1950-60's international ships serving Pacific freight and passenger demands were scalable at various sizes to complement port marine and wharf infrastructure at Pacific island ports. Ports were being rebuilt from timber structures to those of concrete decks and piles up to 150m in length, shore cranes were absent and loose general cargo remained dominant.

Bulk petroleum fuels were being imported by tanker ships and shore-based fuel tanks were being construction for national fuel storage. The mixture of ship types was evolving as scheduled passenger air services were deployed more frequently. General cargo ships operated widely in Pacific trades between Australia/New Zealand, West Coast USA, and Asia to Pacific island ports typified by the SS Burnside at 8,800 deadweight tonnes (DWT) and 120m length, see Figure 4.

Figure 4 - Typical Pacific Class Freighter Circa 1955 (ASL, 2021)



The traditional dry cargo ship was loaded with loose cargoes handled in different forms. Each time the ship docked, cargo had to be loaded and discharged using slings and pallets lifted by ships derricks and trolleyed between warehouses at dockside. This made cargo handling complicated and time consuming. A turn-round in port often took 4-7 days to complete, see Figure 5.

There was always the danger of cargo being damaged, and pilfering was often a major problem. Pacific island ports typically had narrow wharf structures with large warehouses in close proximity to wharf side to facilitate transfer of loose cargoes to undercover storage.

Figure 5 - Lautoka Port, Fiji; Ship Handling Conventional Cargoes Circa 1950 (FPCL, 2020)



2.2.5 Shipping Container Revolution

Undoubtedly, one of the most important events in modern transport history was the advent of containerisation. The revolutionary concept enabled problems of delays and cargo loss/damage to be overcome. Once the container was loaded and sealed it could be transported by ship, truck, or train with equal ease. Land and sea transport, in short, could be fully integrated. A shipload of containers could be loaded or unloaded in hours rather than many days, enabling turn-round times to be greatly reduced.

The credit for the container revolution is widely recognised as Malcolm McLean, a road transport operator from North Carolina in the US that pioneered shipping containers in 1956. Matson Navigation Company ship the Hawaiian Merchant, which sailed from San Francisco to Honolulu on 31 August 1958 can claim to be the world's first container ship, see Figure 6.

Figure 6 – MV Hawaiian Merchant 1958 at Honolulu Port (Matson Line, 2021)



By the 1960s the size of containers had been standardised at 20 feet by 8 feet by 8.5 feet. Although many containers in use today are 40 feet in length, container ship capacity is still measured in Twenty feet Equivalent Units, or TEUs. Purpose-built cellular container ships were being built. Several shipping companies in Europe

banded together to set up specialist container shipping companies, including Overseas Containers Ltd. (OCL) and Associated Container Transportation Ltd. (ACT).

Despite the compelling nature of container transport, Pacific island trade routes were slower to transition to full containerised operations. This was partly due to the need to widen and strengthen wharves to facilitate container handling trucks and stacking equipment. An equally significant aspect of the transformation required to handle containers at Pacific ports was the need for transitioning to ships with cranes of sufficient capacity to lift containers of up to 25 tonnes and land to wharf face at extended outreach, see Figure 7.

Figure 7 - Multipurpose Container Ship at Apia Port Samoa (AMSTEC Pty Ltd, 2016)



Since 1972 the number of containers handled by the world's ports has grown from 6.3 million to 815.6 million twenty-foot equivalent units (TEU) in 2020, (UNCTAD, 2021). As a comparison the 11 Pacific island states shown in Table 3 accounted for 708,000 TEU or 0.08% of global volumes in 2018. This huge increase in traffic has also had a major impact on ports which have had to transition to larger container specific capacity terminals and in many cases having to relocate from original sites that were constrained by their proximity to urban centres.

2.2.6 Challenges for Pacific Ports

Pacific island ports of the 1960-70's had legacy issues associated with 1920-60 wharf designs scaled for traditional general cargo ships with lengths at 60-120m, most typified with narrow wharf frontage with low weight bearing decks. Cargo handling areas were occupied with large warehouses either on the wharf or in close proximity that obstructed the ability to handle the challenge of increasing numbers of containers, see Figure 8.

Pacific port non-covered terminal areas, previously not required in large acreage was now essential in large scale for the storage of full and empty containers. Road access for heavy trucks hauling full and empty containers was needed as was flat land with good drainage for storage of containers. Tallying (counting and sorting) loose cargo by using large numbers of tally clerk staff was no longer needed in such numbers. Retraining port and stevedore staff was required especially drivers for heavy fork hoists and ship cranes with higher capacity payloads.

The evidence to support this assessment is stated in various public reports including the Pacific Regional Transport Study 2004, that stated "many port facilities were built in the 1950s or 1960s, prior to containerisation and such ports pose serious operational problems. Cargo sheds designed to shelter breakbulk cargo from extreme weather conditions now pose obstacles to the efficient movement of containers between ships and stacking areas. Some wharves, unable to take the weight of a forklift plus heavy container, require

double handling of containers. A lack of maintenance was noticeable in many ports. Typically, security was lax or non-existent (see below ISPS Code), (PIF, 2004).

Figure 8 - Warehouses on Wharf Deck at Lautoka Port 2017 (AMSTEC Pty Ltd, 2016)



Despite the urgency in global ports to transform to full containerised operations the Pacific island ports did not require a full transition. This was due mainly to the lack of shore side cranes and lower volumes of container throughput and ports needing to remain as multiuser facilities. The transformation at Pacific island ports can be summed up as a sideways shift to containerisation. Many ports removed warehouse structures that were too close to the wharf side to expand container handling areas. Those that did not demolish warehouses, instead increased the land area behind the wharf apron to create container yard storage.

Concurrently as with containerisation, ship sizes arriving at Pacific ports grew in capacity and thus length. This dynamic was tempered by the fact that shipping routes are fixed rotations through a number of Pacific countries and thus the smallest port (depth and wharf) influenced the maximum size of the vessels. In many Pacific island trade routes shipping lines have wrestled with this conundrum and adjusted scheduled rotations to create subset shipping patterns. This restricted covenant is likely to have contributed to the accelerated status of Suva as a hub Pacific transshipment port for the smaller scaled ports of Tuvalu, Nauru, and Kiribati.

Pacific countries traditional bilateral government partners (Britain, France, Australia, and New Zealand) provided assistance through the 1960's-90's to construct new higher capacity wharves and larger laydown areas. This period also was marked by a transition to independence of Pacific nations and ports were often a focal point of national pride. At the same time the new Pacific governments and their administration had to take over responsibility for compliance of maritime and ports regulation at international and national levels.

In the face of such multifaceted transformational activities Pacific countries struggled to keep pace and despite efforts lagged in achieving a smooth and prompt transition to modern landlord port management and maritime safety compliance. Assistance in many forms, at institutional, technical, infrastructure, policy and governance levels were requested and provided by governments with bilateral relations and increasingly by multi-lateral development banks (MDB's).

The current situation as at the end of 2021 for Pacific ports and shipping can be characterised as emerging with renewed needs for expansion, redesign and in some instances relocation as is the case for Suva port in Fiji. The issues for ports are the same as when containerisation first was imposed on the Pacific nations transport systems – it is the increased scale that has elevated the immediacy of new imperatives.

2.3 International Shipping

2.3.1 Overview

PICs are heavily reliant upon international shipping to deliver essential commodities such as foodstuffs, building materials, fuels, and motor vehicles. Many PICs do not manufacture basic construction materials and must import cement, bitumen, structural steel, timber, bricks, and pavers. Indeed, many PICs - particularly atoll states - must import construction grade sand and aggregate in bulk volumes for major projects.

It can be suggested that international shipping in the Pacific is commercially mature in its make-up of service providers and networks which have changed little in the last 30 years. The ship types operated on international services are typified by deployment of the multi-purpose general cargo and container vessels which have ship mounted cranes, see Figure 9. These types of ships are required in PIC services due to the absence of shore cargo cranes at the majority of PIC ports.

Figure 9 - Typical Multi-Purpose Container Ship at Port Vila, Vanuatu (courtesy of AMSTEC Pty Ltd)



2.3.2 Shipping Lines

International shipping networks serving the Pacific islands are dominated by a small number of shipping lines and ship operators. Those shipping operators engaged in dedicated shipping networks are corporations being held by private interests or public listed entities. These shipping firms operate with ships that are under long term charter or as owned assets that they have purpose built for the Pacific trade routes, see Figure 9. The typical attributes of these shipping lines are that they are part of a larger corporate entity and have other direct or indirect commercial interests in the Pacific countries they provide shipping services to. Many of these shipping organisations are part of larger corporate entities either as subsidiaries or associate businesses.

Many of the international lines are controlled from global headquarters and manage their shipping interests in PICs by appointment of local port agents or have their own port agency office network in a number of countries their ships call at directly. It is important to note that many shipping lines form alliances and consortia. These arrangements form 'space-sharing' on ships operated on agreed routes that allow each carrier to reduce their overall deployment of ships and manage an agreed share of ship capacity on the service networks they jointly operate.

In the last ten years there has been a rationalisation of shipping lines servicing Pacific trade routes. In 2012 Matson line acquired Reef Shipping (Schuler, 2012), this was followed in 2013 by Swire Shipping Group purchase of Polynesia Line Ltd, (Sea News International, 2013). Then in 2017 global giant CMA-CGM purchased Sofrana Unilines via their subsidiary ANL (Asia Today News, 2017), this was then followed most recently in 2020 with Neptune Pacific Line purchase of Singapore owned PDL to form the newly branded NPD, (The Maritime Executive, 2020).

The following table describes a high-level overview of the main international shipping lines operating in the Pacific island's trades including their ownership, headquarters, affiliates, and number of ships operated.

Table 1 - Profiles of Main Shipping Lines Operating in the Pacific (Annual reports – SX searches)

Shipping Line	Head Offices(s)	Affiliate Cos	Ships operated globally
Swire Shipping Principal shareholder John Swire & Sons Ltd * Listed HKSAR China	London / Singapore	John Swire & Sons Ltd. Steamships Trading PNG Swire Agencies Consort Express Line *Swire Pacific Offshore *Cathay Pacific Airways *Swire Properties	185
Neptune Pacific Direct Line Principal owner Wonderful Company LLC # JV between Gov of Samoa & NPDL. Managed by NPDL	Singapore / Auckland	The Wonderful Company USA #Pacific Forum Line Fiji Water Pacific Bulk Fuel	8
Kyowa Shipping Co Principal shareholders Hiromitsu Takamatsu Sankyu Inc.	Tokyo	Pacific Line Trading Ace Creation Co Toritec Co., Ltd	9
ANL Container Line Principal shareholder CMACGM Listed LUXSX: CMA CGM SA	Marseille / Melbourne	CMA CGM Group APL (American President Lines) MERCOSUL LINE CEVA Logistics	530
Maersk Line Publicly traded family business NASDAQ: MAERSKA-B ++ Hamburg Sud purchased by Maersk in 2017	Copenhagen	AP Moller APM Terminals DAMCO Svitzer Towage ++Hamburg Sud Sealand Safmarine	708
Matson Line Listed NYSE: MATX	Oakland / Honolulu	Matson Terminals Inc Matson Logistics Inc	15
Nauru Shipping Line	Nauru	Nauru Government Nauru Ports Authority	1

Source: Compiled an annual report from each shipping company.

2.3.3 Shipping Routes

Shipping routes that connect Pacific island countries are concentrated with four (4) main shipping lines/consortia that provide the majority of shipping frequency and capacity. The international Shipping networks connecting Pacific island countries can be described in three different categories:

1. International Gateway port services
 - a. These services are typified by scheduled international multipurpose container ships operating on a fixed port schedule with a direct connection to a non-Pacific island country such as Japan, Singapore, Australia, USA, or New Zealand.
 - b. Examples of these services are Kyowa Shipping Line scheduled service calling direct at gateway ports in Japan and Republic of Korea servicing ports in Republic of Marshall Islands, Federated States of Micronesia, Guam, and Saipan, returning to Japan and Republic of Korea.

2. Regional International hub port services,
 - a. These services are typified by scheduled international multi-purpose container ships operating on a fixed port schedule using a Pacific island port as the primary origin and transshipment hub.
 - b. Examples of these services are Neptune Pacific Direct Line (NPDL) scheduled service calling direct at the Hub ports in Fiji servicing ports in Kiribati and Tuvalu, returning to Fiji.
3. Regional feeder port services
 - a. These services are typified by scheduled and informal scheduled general cargo ships and passenger / freight ferries.
 - b. Examples of these services are the government of Tokelau shipping connections from Apia, Samoa that shuttle direct to Tokelau carrying passengers and freight. And the ferry service operating between Samoa and American Samoa provided by Samoa Shipping Corporation.

As identified the majority of merchandise freight delivered to Pacific countries is carried in shipping containers using dedicated multipurpose container ships (ADB, 2007).

The liner shipping routes described in Table 2 form three distinct patterns, (i) Continental shipping connections from USA, China, and Europe that transit through the Pacific islands, some with multiple port calls throughout an island service route, (ii) International Pacific islands connections from Australia/New Zealand and Japan/ Republic of Korea – these dedicated networks operate multiple vessels on fixed schedules and typified by multipurpose geared container ships and (iii) the intra Pacific islands connections – this describes those shipping connections that have an origination base port in one Pacific islands port (Suva port, Fiji) and maintain dedicated services to other Pacific island nations ports (Funafuti port, Tuvalu and Nauru port).

The shipping density map, Figure 10, shows the centric nature of Fiji in container shipping routes with the high intensity of connectivity to Australia and New Zealand displayed and the visualisation of inter-Pacific transshipment connections from Fijian ports of Suva and Lautoka to outlier states.

Also visualised in the map is those container shipping routes which do not direct call at Pacific island ports – mostly being cellular non-geared container ships that are too large to call at Pacific island ports and rely upon shore mounted container cranes.

Figure 10 - Container Shipping Route Density Map 2019 (Marine Traffic , 2019)

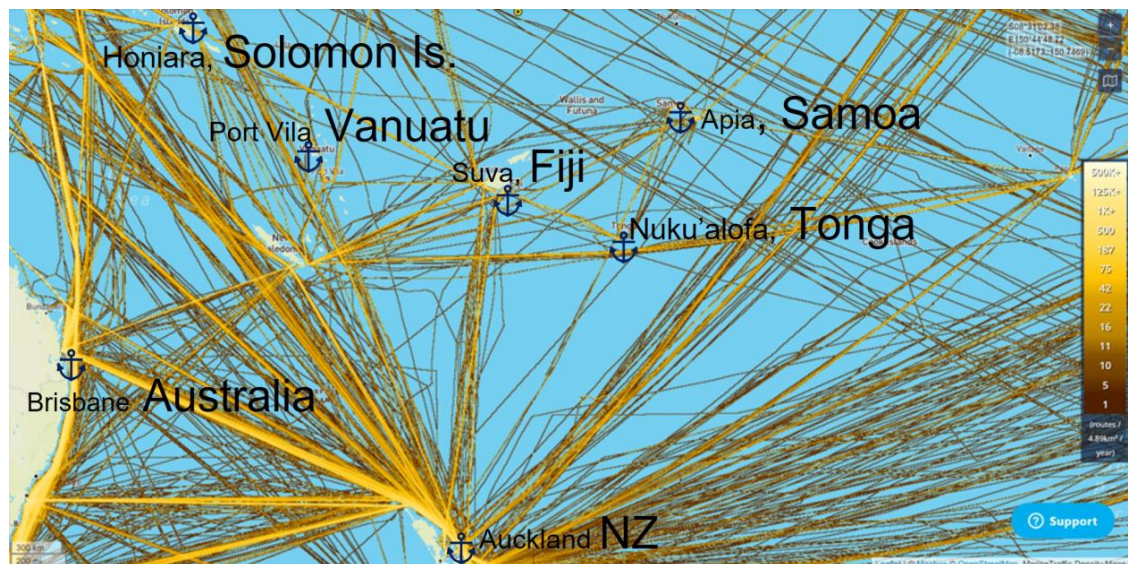


Table 2 - Main Pacific island shipping routes by shipping line

Shipping Line	
Swire Shipping	SE ASIA SERVICE: 3 vessels, 10 direct ports, 20-day frequency, 60-day rotation; Sriracha/Singapore/Noumea/Lautoka/Suva/Auckland/Brisbane/Motukea/Lae/ Lihir.
	PACIFIC ISLANDS SERVICE (Consortia with AUSPAC): 2 vessels, 11 direct ports, 18-day frequency, 36-day rotation; Melbourne/Sydney/Brisbane/Prony Bay/Noumea/Port Vila/Lautoka/Suva/Apia/Pago Pago/Nuku'alofa/Santo/Papeete
	MICRONESIA SERVICE (Consortia with APL): 2 vessels, 4 direct ports, 7-day frequency 14-day rotation; Busan/Yokohama/Guam/Saipan
	NEW ZEALAND EASTERN PACIFIC SERVICE (Consortia with Matson Line): 3 vessels, 10 direct ports, 10-day frequency 30-day rotation: Auckland/Nukualofa/Lautoka/Suva/Apia/Pago Pago/Rarotonga/Aitutaki/Niue*/Vava'u*/Papeete (*alternate calls).
	NORTH ASIA SERVICE: 4 vessels, 16 direct ports, 20-day frequency, 80-day rotation: Kaohsiung/Shanghai/Hatsukaishi/Yokohama/Osaka/Busan/Ningbo/Nansha/Lae/Rabaul/Motukea/Honiara/Noumea/Vavouto/Auckland/Timaru/Tauranga/Marsden Point
	PACIFIC NORTH ASIA SERVICE (Consortia with MYK & Kyowa): 8 vessels, 20 direct ports, 7-day frequency, 64-day rotation: Kaohsiung / Tianjin/ Qingdao/ Busan/ Kobe/ Nagoya/ Yokohama/ Majuro/Tarawa/Honiara/Port/Vila/Santo/Noumea/Lautoka/Suva/Apia/PagoPago/Nukualofa/Papeete
	PAPUA NEW GUINEA SERVICE: 2 vessels, 8 direct ports, 9-day frequency, 36-day rotation: Melbourne/Sydney/Brisbane/Motukea/Lae/Lihir/Honiara
	POLYNESIA SERVICE (Consortia with Hamburg-Sud) : 2 vessels, 5 direct ports, 17-day frequency, 34-day rotation: Longbeach/Oakland/Papeete/Apia/Pago Pago
Neptune Pacific Direct Line	NEW ZEALAND TO FIJI SERVICE (Consortia with Maersk): 3 vessels, 5 direct ports, 7-day frequency, 36-day rotation: Napier/Lyttleton/Tauranga/Auckland/Suva/Lautoka
	NEW ZEALAND TO SAMOA, AMERICAN SAMOA & TONGA SERVICE: 1 vessels, 4 direct ports, 18-day frequency, 21-day rotation: Auckland/Nuku'alofa/Apia/Pago Pago
	FIJI to WALLIS FORTUNA & SAMOAS SERVICE: 1 vessels, 4 direct ports, 21-day frequency, 21-day rotation: Suva/Pago Pago/ Apia/Wallis/ Fortuna
	NEW ZEALAND TO NEW CALEDONIA & VANUATU SERVICE: 4 vessels, 7 direct ports, 7-day frequency, 34-day rotation: Tauranga/Auckland/Noumea/Lautoka/Suva/Port Vila/Santo
	FIJI TO TUVALU & KIRIBATI SERVICE: 2 vessels, 4 direct ports, 21-day frequency, 30-day rotation: Suva/Funafuti/Tarawa/Kiritimati
	FIJI TO MICRONESIA & SOLOMON IS SERVICE (Consortia with PIL): 3 vessels, 5 direct ports, 24-day frequency, undetermined day rotation: Suva/Majuro/Kosrae/Pohnpei /Honiara
	NEW ZEALAND to COOKS & VAVAU SERVICE (Consortia with Matson): vessels, 4 direct ports, 21-day frequency, undetermined day rotation: Auckland/Rarotonga/Aitutaki/Vavau
Kyowa Shipping Co	MICRONESIA SERVICE: 3 vessels, 14 direct ports, 21-day frequency, 45-day rotation: Busan, Kobe, Nagoya, Yokohama, Saipan, Guam, Koror, Yap, Chuuk, Pohnpei, Kosrae, Majuro, Kwajalein, Ebeye.
	PAPUA NEW GUINEA SERVICE: 2 vessels, 10 direct ports, 32-day frequency, undetermined day rotation: Busan, Chofu, Moji, Kobe, Nagoya, Yokohama, Lae, Port Moresby, Rabaul, Townsville
	SOUTH PACIFIC SERVICE (Consortia with Swire): 4 vessels, 16 direct ports, 14-day frequency, undetermined day rotation Busan, Kobe, Nagoya, Yokohama, Tarawa, Honiara, Port Vila, Santo, Noumea, Suva, Lautoka, Nukualofa, Apia, Pago Pago, Papeete, Funafuti
Matson Line	USA to SOUTH PACIFIC SERVICE (Consortia with Hamburg Sud): 2 vessels, 5 direct ports, 14-day frequency 30-day rotation: Long Beach/Oakland/Papeete/Pago Pago/Apia
	NEW ZEALAND SOUTH PACIFIC SERVICE (Vessel sharing with NPD & Swire on selected routes): 3 vessels, 11 direct ports, 24-day frequency 32-day rotation: Auckland/Nukualofa/Lautoka/Suva/Apia/Pago Pago/Rarotonga/ Aitutaki/Niue/Vavau/Nukualofa
	US WEST COAST to HAWAII SERVICE: 8 vessels, 8 direct ports, 4-day frequency (at Honolulu) 35-day rotation (variable): Tacoma/Oakland/Los Angeles/ Honolulu/4 other Hawaii ports
	US WEST COASTS to GUAM & SAIPAN SERVICE: 8 vessels, 6 direct ports, 35-day frequency (variable) Tacoma/Oakland/Los Angeles/ Honolulu/Guam/Saipan

Nauru Shipping Line	FIJI to NAURU SERVICE: 1 vessel, 3 direct ports, 30-day frequency, 30-day rotation (variable): Suva/Honiara/Nauru (service commenced in 2020)
Maersk Line	NEW ZEALAND TO FIJI SERVICE (Consortia with NPDL): 3 vessels, 5 direct ports, 7-day frequency, 36-day rotation: Napier/Lyttleton/Tauranga/Auckland/Suva/Lautoka SE ASIA to PNG-SI: 2 Vessels, 14 Day frequency. Tanjung Pelepas – Singapore – Motukea – Noro – Lae – Wewak – Madang - Tanjung Pelepas.
ANL - SOFRANA	NEW ZEALAND to PNG – SI, 2 vessels, 17-day rotation. Auckland – Tauranga -Noumea – Brisbane - Motukea – Lae – Kimbe* -Rabaul – Honiara – Brisbane – Auckland *Alternate voys. SE ASIA to PNG – 2 vessels, 16-day rotation. Port Klang – Singapore – Jakarta - Motukea – Lae – Rabaul*– Madang* – Kimbe* – Port Klang *-Alternate voyages
Source: Compiled by study team based on the current shipping lines schedules, searched in December 2021	

2.4 International Freight

2.4.1 Overview

PICs are heavily reliant upon imported products for construction, energy, motor vehicles and merchandise to support communities and tourism. Indeed, scholars reviewing PIC economies have noted that the small size of a domestic market severely limits import substitution possibilities (Worrell, 1992). The vast majority of imports up to 90% in some states arrives by sea. A major element of imported goods in PIC's is foodstuffs. These food imports are to supplement PIC traditional methods of food production. The UN Food and Agriculture Organization (FAO) has developed a Food Import Capability Index (FICI) which measures the proportion of food imports to total exports (UNFAO, 2021). As identified in various reports; countries scoring a FICI >0.5 is considered vulnerable in terms of food security, and countries with FICI >1.0 (value of imported food exceeds the total export value) is considered highly vulnerable. Tuvalu and Samoa, with average FICIs of 5.48 and 2.59, respectively, rank as two of the most vulnerable Small Island Developing States in terms of this food security indicator, (McGregor, . Bourke, & Sakiusa, 2009).

As noted in a recent International Monetary Working Paper (IMF) 'on average, imports of goods make up about 60 percent of GDP for Pacific islands. In contrast, exports of goods (excluding re-exports) are less than 10 percent of GDP for all Pacific islands, except for Fiji (sugar), Nauru (phosphate), and Solomon Islands (timber)' (Arslanalp, Koepke, & Verschuur, 2021).

The overall volumes of merchandise freight movements to Pacific islands are dominated by shipping containers. In many PICs this containerised handling of freight is concentrated towards twenty-foot container (TEU) loads as in some PICs limitations for handling forty-foot containers is present at the port or within the hinterland supply chain operations networks. The global shift to handling freight in forty-foot (FEU) containers has been prevalent in developed countries as is the growth in ship size to vessels of 23,000 TEU capacity as the economies of scale allows for a lower unit price of goods transported (LIM, 2011).

The overall volumes of containerised freight movements are low when compared to global container volumes and subsequently the shipping assets and port infrastructure and supply chain networks are scaled accordingly. As a comparison a vessel on the Trans-Pacific trade operating between Japan, Republic of Korea, China, and USA-West Coast ports has a capacity of 18,000-23,000 TEU whereas the vessels operating from Australia, New Zealand to Pacific island ports has a capacity of 1,200 TEU, (Alpha Liner, 2021). Similarly, the scale of ports to cater for the volumes at PIC's presents a lower scale to which drive economies of scale opportunity savings, (UNCTAD, 2021). This point is sustained when reviewing the port capacity given that an average port scale in the main trade routes cited above is for example; Shanghai port, China has a design capacity of 6.3 million TEU annual capacity (Lloyds List , 2021) compared to Apia port, Samoa where the annual container stacking capacity is about 50,000 TEU, (JICA, 2015).

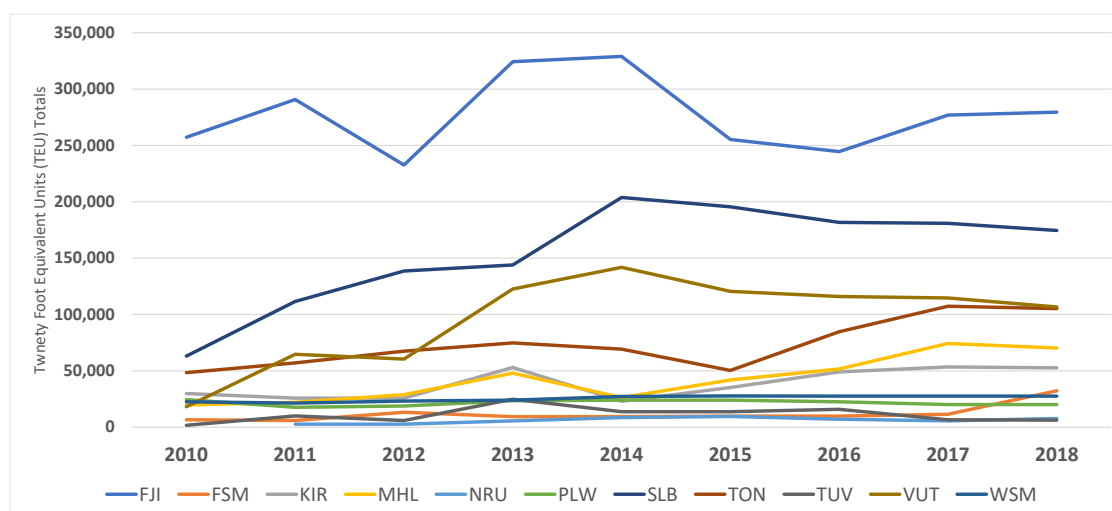
The representation of total TEU volumes comprised of imports, exports and transshipments shows that Fiji presents as the major freight handling PIC followed by the Solomon Islands. These findings are not surprising as the populations of both at just under one million and 750,000 respectively, are far greater than the majority small PIC populations which average 117,000 persons, (World Bank Meta-Data , 2021). Additionally, the largest PIC countries by TEU trade volume are also engaged in transshipment volumes with Fiji being classified as a hub port that shipping lines have centralised transshipment shipping efforts through, (NPDL, 2021).

Another important note is the relevance of Fiji as being one of the few PIC countries that has developed a manufacturing base. Manufacturing in Fiji is notably concentrated towards foodstuffs, textiles, construction materials (plywood, construction timber and formwork) and cement. This baseline of manufactured products supply has allowed Fiji to develop intra-regional trade amongst Pacific SIDS with Fiji becoming the largest exporting country, representing 84 per cent (or \$320 million) of the total intra-Pacific SIDS' exports (UNCTAD, 2014). The contrast is the absence of manufacturing in the smaller PIC states, particularly the atoll countries of Micronesia (Palau, RMI and Kiribati) and the small states of Polynesia, (Tuvalu, Tonga, and Samoa).

The data presented in Figure 11, represents that sourced from UNCTAD (unctad.org/en/Pages/statistics.aspx) for developing nations meta-data. This representation shows for the eleven PIC states an average TEU throughput of 80,000 TEU in 2018, which after removing the two largest outlier states (Fiji and Solomon Islands) provides an average TEU throughput of 64,000 TEU in 2018.

An equally significant aspect of consideration when reviewing containerised throughput at PICs is the imbalance between full and empty containers, which presents a significant issue in both supply and value chain conditions. The important point to note is that it is a common problem amongst the PICs where the ratio between full imports and full exports is heavily weighted towards imports and in some PIC ports it is reported that up to 90% of exports are empty containers, noted in studies as exports are dominated by back-loaded empty containers, (ADB, 2020).

Figure 11 - Total TEU Volume Chart PIC's 2010 – 2018 (UNCTAD, 2021)



The supporting table below shows the quantified volumes relevant to the chart in Figure 11¹.

Table 3 – Total TEU Volume Statistics at PIC Ports 2010 – 2018 (UNCTAD, 2021)

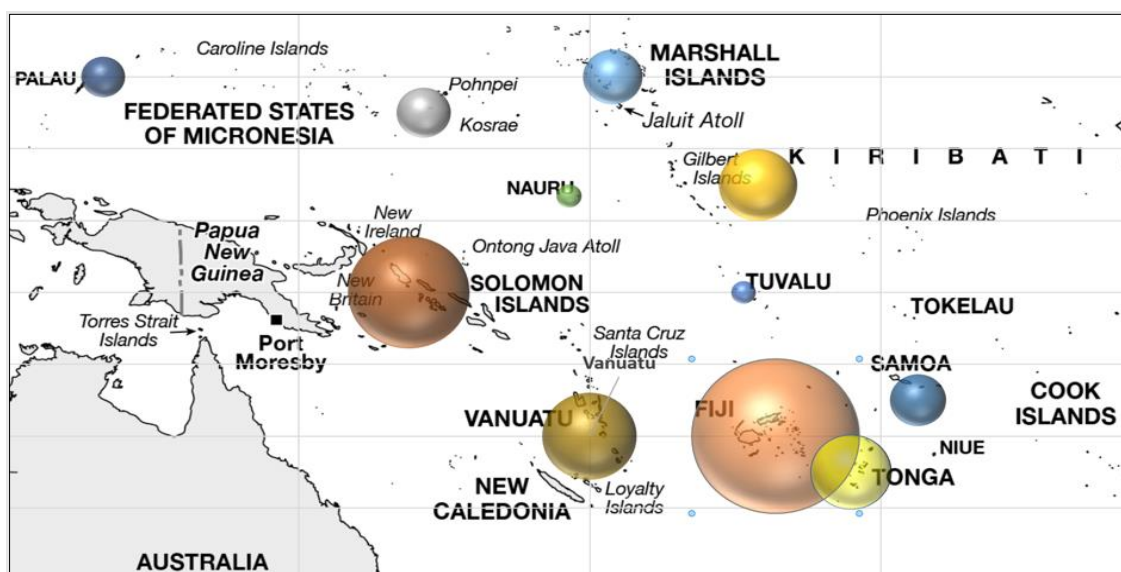
	2010	2011	2012	2013	2014	2015	2016	2017	2018
FJI	257,316	290,789	232,617	324,270	329,097	255,214	244,524	276,944	279,466
FSM	6,570	5,900	13,192	9,270	9,270	9,815	9,815	11,434	32,195
KIR	29,876	25,776	25,776	52,964	22,998	35,149	49,005	53,469	52,568
MHL	19,700	21,989	28,797	47,899	26,168	41,855	51,613	74,194	70,146
NRU		2,597	2,597	5,563	8,530	9,438	7,033	5,536	7,607
PLW	24,446	17,629	18,800	23,548	23,960	23,891	22,490	20,009	20,059
SLB	63,095	111,620	138,567	143,880	203,915	195,524	181,636	180,838	174,614
TON	48,431	57,059	67,349	74,745	69,196	50,408	84,702	107,381	105,190
TUV	1,719	9,976	5,847	24,770	13,766	13,766	15,844	6,500	6,188
VUT	18,040	64,663	60,342	122,540	141,788	120,492	115,887	114,553	106,680
WSM	22,465	21,420	23,137	24,006	27,198	27,719	27,459	27,589	27,524

¹ Original data is from UNCTAD statistics for Developing Nations data base. Discrepancies exist when comparing the UNCTAD data with scoping and masterplan reports from Multilateral Development Agencies. It is recommended that the volumes stated below are used as a guide and follow up studies may be required to validate exact throughout volumes for specific development initiatives.

A further visual explanation of the variance in TEU throughout at Pacific island ports is provided in the bubble chart below, see Figure 12. This clearly demonstrates the concentration of throughput identified and explained relative to Fiji and Solomon Islands. The TEU totals do not represent bulk fuels (liquid and gas petroleum products) and dry bulk commodities (clinker, sand, aggregate, fertilisers, and grains). In addition, there are a number of mobile vehicle imports at a few Pacific island ports carried by Pure Car Carrier (PCC) ships.

The total percentage of bulk petroleum fuel imports as a proportion of merchandise trade has been declining in the last decade as the Pacific islands move towards renewable energy. In 2008 bulk fuel imports as a percentage of merchandise trade was 30.7% whereas in 2018 it was recorded at 19.7%, (WITS, 2021). The trade data for containerised merchandise also excludes bulk fisheries volumes where hard frozen catch is transferred from fishing fleets to refrigerated bulk fish carriers, mostly anchorages. In 2019 the total Western Central Pacific Ocean (WCPO) catch was estimated at 2.98 million metric tonnes, the highest on record, (FFA, 2020).

Figure 12 - Total TEU Volumes Visualization Chart 2018



Source: Study team illustrated based on UNCTAD data

2.4.2 Trade and transport facilitation

The subject of trade and freight costs is an extensive area of research. The fundamentals of country-by-country variations of trade related costs are most commonly aligned to distance, weight, size, and volume of traded commodities. There are further macro considerations related to the availability of competitive transport options, global pricing and control of commodities and national and trans-national regulations. Studies that have delved into the subject have required a depth of quantitative data related to cost of insurance and freight (CIF) and Free-on-Board costs (FOB) data. The PICs are challenged when providing such consistency of cost data, yet some studies have elaborated the nature of freight charges in comparison to units of commodities against other trade routes.

A notable collective report that covers assessment of the cost of trade and transport mentions that 'the international best practice score for (OECD) trade facilitation is 18.3, which is way higher than the scores in the Pacific region' (PIF, 2020). This report goes on to add that; 'Fiji is the highest scoring country and the closest to the international best practice, with a score of 11.9 out of 20. The region overall lacks in most indicators, especially in external border agency cooperation, governance, advance rulings, information, and automation. Overall PICs' average score (6.7) is a bit lower than average for low-income countries (7.4). The extract from the report is recreated in Table 4 to show a comparison with New Zealand's trade facilitation overall score.

Table 4 - OECD PIC Trade Facilitation Scores 2019

OECD Trade facilitation 2019	FIJ	VUT	WSM	TON	PLW	SLB	FSM	KIR	NZL
OECD Trade facilitation score	11.9	7.8	7.2	6.4	4.9	4.3	3.7	3.3	19.54
Average Trade facilitation score	1.082	0.975	0.903	0.796	0.487	0.539	0.458	0.298	1.776

Recent Covid-19 related escalations in freight rates have distorted the global comparisons of freight rates between PIC's and main global routes. The following high-level representations are provided from 2019 studies as an insight into the findings of variances between PIC trade costs and those existing in more developed and competitive trade routes at that time.

2.5 Ports in Pacific Island Countries

2.5.1 Overview

Seaports in Pacific island countries are mostly situated in the capital cities being the original site of development and serving the immediate demand characteristics of population concentration and commercial activity. In most of the smaller Pacific island States a higher percentage of the population tends to live in the capital or near the capital and on the same island. The other towns and villages tend to be small, so the population often divide into an urban group, concentrated in and near the capital, and rural villages, where the population practices a subsistence agricultural economy, growing fruit and vegetables for their own consumption and selling the surplus to the capital population for cash to support imports of non-agricultural items, (ADB, 2020).

It is typical that for most PICs there will be just one international designated port to serve the entire nation. This has potential concern as to the lack of alternatives should the primary facility be out of action for any reason. This was potentially the case for Apia port, Samoa in 2009 when the container ship Forum Samoa II ran aground at the channel entrance to the international port. The vessel required overseas technical support which resulted in it being freed from the reef and channel entrance, (RNZ, 2009). Lack of redundancy at Pacific islands ports create the potential for restricting international ship connectivity. Limited port choice may also inhibit local importer/exporters bargaining powers, (Magala & Sammons, 2008).

2.5.2 Multi-User Facilities

Due to the scale and frequency of demand of goods the Pacific island ports are typically multi-user facilities. This defines them as providing infrastructure and services for a variety of ship types and cargo types at the same port zone, see Figure 13 showing purse seine fisheries vessels and multi-purpose container ship cargo at the multiuser berth in Pohnpei port. In global settings where demand is larger, ports become specialists at providing services for different cargo types and ships. Such is the emergence of ports that concentrate on one commodity type which are geographically removed from each other. Compared with global ports in larger countries, PICs experience low frequency of shipping, at relatively high cost of freight on goods, have multiuser ports handling relatively low volumes of freight and experience a concentration of few shipping lines involved in the supply of direct shipping routes.

Low traffic volumes mean Pacific island ports are on the whole not congested. They nevertheless have lower throughput efficiency than global ports, particularly those dedicated container ports in Asia. This is partly due to older equipment and design of these ports which were not built to handle container traffic. None of the Pacific island ports in this study have rail mounted ship-to-shore container cranes². This increases ship turnaround time and means that ships docking at these ports have to have their own cranes, limiting ports' ability to service international traffic, (World Bank, 2006)

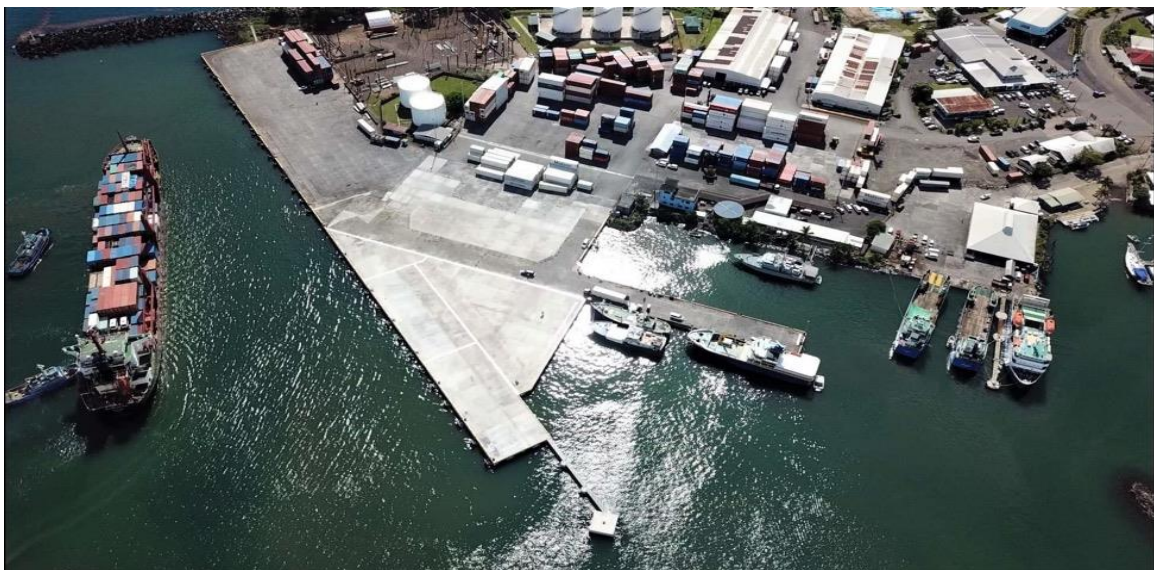
² Mobile harbour cranes reside at Lautoka and Suva ports – these are underutilized due outages and preference for ships cranes.

Figure 13 – Multi-Purpose Container Ship and Fisheries Fleet at Pohnpei Port, FSM (AMSTEC Pty Ltd)



Operational efficiency at Pacific island ports is compounded by poor asset maintenance meaning that plant equipment and structures degrade more quickly and are not adequately or routinely inspected and repaired. Often the main international port of the country will also host the domestic shipping activities. This requires a physical separation of coastal inter-island infrastructure and that designated for international trade. As the domestic inter-island trade requires passenger terminal areas and undercover reception areas this further compromises the available space in which to host all the multi-user structures required for each activity. In many older legacy ports in the Pacific, they have retained large cargo storage sheds (often underutilised) which occupy land which otherwise would be used for container storage. Figure 14 shows a good example of a multiuser port (Apia port) within a small port zone area at which it is possible to identify; petroleum storage tanks, domestic ferry passenger terminal, cargo sheds, yacht marina and hospitality waterfront, heavy plant machinery storage area, customs and quarantine buildings, police patrol boat base, cable storage shed under-construction and the container storage yard. In addition, the proximity of urban residential dwellings to the port can be noted.

Figure 14 – Apia port, International Terminal Multi Users Port (JICA 2018)



2.5.3 Port Reform

Many Pacific island ports are legislated monopolies created when governments transitioned to independent states. As such they may benefit from an evaluation of how best to operate and exploit / and /or avoid the pitfalls of their own competition and consumer laws. The PIC region has only a few instances of where port concessions have occurred (Fiji/Vanuatu/PNG/Palau³) making the Port Authority a formalised Landlord with subordinate port operators taking operational control of the port and terminal facilities. It is generally recognised that benefit is derived by transitioning to a landlord model at ports. This allows divestment of capex and recurrent opex and minimizing risks to government owned enterprises. A Landlord port also allows the private sector to drive efficiency and productivity that creates national benefit for enhancing trade, (PPIAF, 2021). In the Pacific island setting only a few ports have transitioned to become full landlord ports with Fiji as one example whereby the Fiji government decided to transition from public owner and operator of international ports to a private concession that involved Suva and Lautoka international ports. In 2013 the Fiji government announced agreement with a Sri Lankan private firm to manage the cargo handling activities in the Ports of Suva and Lautoka on a concession period of 15 years, (MoC Fiji Govt., 2013). The Fiji government has also allowed the Sri Lankan firm to invest in the Fiji Ports Corporation, giving a foreign firm ownership in both operating company and the landlord, (MoC Fiji Govt, 2015). Another example of transition toward full landlord port status is Port Vila in Vanuatu. Under an Official development assistance (ODA) loan from JICA the Vanuatu government constructed a new port and container terminal facility (Lapetasi) at Port Vila which was commissioned in 2018. This new terminal was concessioned to a Vanuatu firm; Ifira Port Development Services (IPDS) to operate as a general cargo and container terminal, see Figure 15. The IPDS was created through a joint venture between Vanuatu Government that owns 49% and the Ifira Wharf and Stevedoring (IWS) that owns 51% of IPDS. The joint venture operates dynamically by a governance framework which will help repay Government loans from Japan (JICA) and pays dividends to government, (VDP, 2020).

Figure 15 - Lapetasi Port Terminal Port Vila, Vanuatu (AMSTEC Pty Ltd)



Reported in various publications other ports claim the status of landlord port, but have not transitioned according to the proper definitions, (PPIAF, 2021). When examining the status of Pacific island ports there are a number that have retained the status of a Service port which predominantly has a public character.

A Service port owns, maintains, and operates every available asset (fixed and mobile), and cargo handling activities are executed by labour employed directly by the port authority. Service ports are usually controlled or report to the ministry of transport (or equivalent) and the board and/or chairperson are civil servant appointees or directly reporting to, the minister concerned.

The Solomon Islands Ports Authority (SIPA) and the Nauru Port are examples of a Service port employing its own stevedoring labour, owning and operating its own plant equipment, and reporting directly through a

³ Palau is an outlier as non-commercial reasons created their condition

board to the designated ministry. It can be suggested that the Service port may lose transparency of its divisional operational costs, which over time may not yield an acceptable return on assets.

Apia port, Samoa and Pohnpei port, FSM are examples of a Tool port in transition. The Tool port definition is whereby the port authority owns, develops, and maintains the port infrastructure as well as the superstructure, including cargo handling equipment. Port authority staff (usually) operate all equipment owned by the port authority. This is the transitioning phase in as much as the ports authority at Samoa and FSM have contracted the stevedore operations to private sector participants that supply and operate their own plant equipment with their own private labour force. Nuku'alofa port in Tonga is in a similar transition, yet it has split the stevedoring tasks between the public port authority and private sector licensed stevedores, (World Bank Group, 2015). The options to move towards a landlord port are explored further in Section 3.7.

2.5.4 Transshipment

When discussing transshipment in this report it refers to that which is international trade. The operational condition being a container which originates at port A, carried on its outbound voyage by a primary container ship and is landed at Port B (transshipment), remains at port B for a period of time and is loaded out on a second container ship and carried to port C as the final international destination. The classification of transshipment in some journals and reports that includes domestic carriage is not valid in this report.

Some ports serve as container transshipment ports in PICs including Suva, Fiji, Lae Port in PNG, Port Vila in Vanuatu, and Apia Port in Samoa. Other Pacific island ports have a desire to attract greater volumes of transshipment containers, yet the dynamics of the Pacific island's container trades means only a few can ever be anointed to such position. The volume of transshipment cargoes through Pacific islands ports is difficult to confirm as most ports that undertake transshipment may report both the lift off and the lift on as well as other moves in the transshipment transaction. A conservative estimate suggests that total container transshipment volume at Pacific island ports is between 10,000 and 15,000 TEU⁴. Development potential of transshipment hub ports in the Pacific is explored further in Section 3.1.

Figure 16 - Container Transshipment Activity at Suva Port (AMSTEC Pty Ltd)



Transshipment in fisheries at Pacific islands is addressed in Section 2.5.6.

⁴ Study team estimate; This accounts for both discharge and load transshipment containers reported in TEU

2.5.5 Cruise Ship Arrivals

In addition to commercial shipping involving container ships, bulk carriers, fishing fleets and tankers the PICs also host arrivals of cruise ships. Most of these cruise ship arrivals are during the southern hemisphere summer coinciding with holiday seasons in Australia and New Zealand (Dec-Mar). During this time cruise companies would base a number of their cruise ship fleet at Sydney, Brisbane and Auckland ports and participate in short haul cruise itineraries of 5-9 nights to south Pacific island ports.

It should be noted that most Pacific island ports place a priority on berthing cruise ship arrivals and thus container ships and tankers are sent to anchorage whilst the cruise ship occupies the berth, usually for 12-24 hours. Port Vila port in Vanuatu is benefited by having a dedicated cruise ship berth (main wharf). A new international multi-purpose wharf development project (Lapetasi) was completed and a handing over ceremony was held in February 2018, this marked the first ODA loan project in Vanuatu for JICA, (JICA, 2019).

The geographic proximity of Vanuatu has made this an ideal cruising destination within the short haul cruise catchment, (Brisbane to Port Vila 1069 n. miles / 2.2 days transit) (NETPAS, 2021). In 2014 this economically attractive voyage route resulted in Vanuatu scheduled to host more than 230 cruise ship calls across 6 ports in 2014. The magnitude of cruise ship passenger arrivals at Vanuatu was recorded in 2013 at more than 240,000 people, (IFC, 2014) see Figure 17.

Other PICs have attempted to attract higher volumes of cruise ship arrivals, yet geographic proximity and cost of fuel from seasonal base ports remains a determining factor. Other cruise shipping itineraries that operate into the Pacific Island region include the round-the-world cruise ships, expedition/boutique cruise ships and those ships engaged on operational repositioning.

Figure 17 - Cruise Ship at Main Wharf in Port Vila - Lapetasi Terminal in background (P&O Cruises Aust)



2.5.6 Fisheries

The Pacific island nations' vast exclusive economic zones (EEZs) benefit from the pelagic migratory nature of tuna in the Pacific Ocean. Some PICs export scalable volumes of tuna based largely upon the volume of possible catch within their own EEZ. In 2019 the total Western Central Pacific Ocean (WCPO) catch was estimated at 2.98 million metric tonnes, the highest on record. This represented 56% of the global catch of 5.3 million metric tonnes, (FFA , 2020). Sustainability of tuna stocks are managed under several multilateral agreements including the Parties to the Nauru Agreement (PNA) which controls the world's largest sustainable tuna purse seine fishery. PNA Members are Federated States of Micronesia, Kiribati, Marshall Islands, Nauru, Palau, Papua New Guinea, Solomon Islands and Tuvalu plus Tokelau. Many PNA conservation measures are world firsts – such as high seas closures to fishing, controls on Fish Aggregating Devices (FADs), Vessel-Day Scheme which calculates how much tuna fishing is sustainable and then divides that amount up into fishing days (PNA, 2021).

The vast majority of tuna catch is exported direct to market as whole fish including Japan, China, and Thailand, being directly transferred from fishing fleets to refrigerated bulk ships, see Figure 18. There are some PICs that engage in processing of tuna catch by value transforming to export quality canned product or primary processing into frozen tuna loin which is exported to factories in Asia for secondary processing into canned products. These processed exports are carried by sea freight in shipping containers from the plant. One such country that has a long-standing tuna processing ability is the Solomon Islands which in 2018 landed to plant 24,969 tonnes of tuna for processing and export, (Tolvanen, Thomas, Lewis, & McCoy, 2019).

Large-scale transhipment of whole frozen tuna at anchorage has potential to reduce revenue to the shoreside port. This is due to anchored vessels not requiring any additional port infrastructure and thus no requirement or income related for towage, mooring services, pilotage to/from the quayside. Revenue is similarly reduced from these operations occurring at anchorage due to fees for berthage and wharfage not required. The income to the ports is through anchorage fees and tonnage transfer fee, which is much lower by comparison to that potential revenue related to ships and cargo movement when alongside the berth.

Figure 18 - Fisheries Transhipment at Anchorage in FSM (AMSTEC Pty Ltd)



2.5.7 Port Productivity and Pricing

Productivity at ports is measured both for the ship arrival and berth occupancy periods and the cargo movements per hour. It is commonplace to measure the ship arrival and departure on the basis of vessel turnaround times and cargo movement on the number of containers handled between the wharf and ship per hour. Both these measures are fraught with probability of error and misrepresentation as the variables and limitations of measure are often not properly defined when presenting the final numbers. For example; a ship

working rate of 12 containers per hour reported by 'port A' may be using a measure of ship working rate using two cranes simultaneously whereas 'port B' that reports 8 moves per hour is reporting only per single crane hour. Another significant factor in assessment of port productivity at Pacific Islands is that modern terminals in East Asia and ASEAN countries should not be comparatively aligned or arguably even used as benchmarks given their advanced development driven by high volume throughout and fierce competitive pressures.

Port productivity ratios must be properly defined otherwise inaccurate representation occurs, (Huynh, 2008) and (JOC, 2014). While such potential misrepresentations must not be discounted, there are comparisons of port productivity published for Pacific island ports, which compare average vessel turn around in days, (PRIF, 2021). The variables in this table require further examination and clarification.

Port productivity ratios shown in Figure 19 are high level guides. As described above sufficient definition is required to adequately compare across different ship types, ports and terminals shown. The reasons for outliers require detailed examination and assessment of the specifics for each port.

The example of Nauru provided shows vessel turnaround in excess of 13 days. Delays are caused by damage and repairs to mooring systems and adverse weather affecting bulk and container vessels (ADB, 2015).

Figure 19 - Average Vessel Turnaround Time by Type of Ship, 2019-2020 (PRIF, 2021)

Country	Passenger Ships (days)	Container Ships (days)	No. of TEU Containers
Cook Islands			8,106
FSM	0.35 days		25,234
Fiji	1.07 days	0.98 days	145,782
Kiribati	1.58 days	1.58 days	52,100
Nauru		13.25 days	5,327
Niue			3,904
Palau			16,399
PNG	1.23 days	1.30 days	338,300
RMI	0.98 days	0.97 days	30,711
Samoa	0.66 days	0.87 days	27,221
Solomon Islands	1.11 days	1.05 days	128,036
Tonga ¹²⁸	0.43 days	0.54 days	76,854
Tuvalu		2.62 days	5,150
Vanuatu	0.88 days	0.88 days	77,436

FSM = Federated States of Micronesia, PNG = Papua New Guinea, RMI = Republic of the Marshall Islands, TEU = twenty-foot equivalent unit.
Note: All data from 2019 except for Nauru (19 Aug 2019–20 Aug 2020) and Tuvalu (Jan–Oct 2020).

Sources: The Pacific Community; Geoscience, Energy and Maritime Division (data for Nauru and Tuvalu received 18 Feb 2021); and United Nations Conference on Trade and Development. Undated. Maritime Country Profiles. <https://unctadstat.unctad.org/CountryProfile/MaritimeProfile/en-GB/776/index.html> (accessed 27 Dec 2020).

Similarly, the pricing of port charges is a matter that has attracted global attention and examination through past and present research. In the Pacific island ports, the common theme encountered is that the current pricing for port charges is attached to legacy tariffs used at the times prior to the creation of current port authorities. These pre-1980-90's tariff documents still can host tariff items which are redundant under modern port arrangements and can include new charge items which may be interpreted as double charges. In some jurisdictions port tariffs are not adequately reflective of the true costs involved in providing services and some port authorities are reticent to increase charges.

There are comparisons of port pricing published for Pacific island ports, (PRIF, 2021) see Figure 20. These partially demonstrate the wide-ranging tariff variances yet fall short of comparing like to like.

The most effective way of comparing port tariffs is to use a standard ship size and standard cargo exchange to arrive at an equalised total and unit cost which allows explicit evaluation, (PSDI, 2016). Thus, the scale of port charges remains low (by comparison to Australia and New Zealand) and may not provide the port authority with sufficient recovery of costs incurred or allow the port to adequately invest in new equipment or budget according to preventative asset maintenance.

Tariff modernisation and methodology for port pricing is a regime which may likely benefit Pacific island ports as well as the study to accurately compare Pacific island ports pricing across the region and establish a true benchmark of pricing for port services. These aspects are further explored in Section 3.6.

Figure 20 – Ports tariffs in Vanuatu, Tonga, Fiji, Cook Is, and Kiribati 2021 (PRIF, 2021)

Tariff Item	Lapetasi Port in Vanuatu		Ports Authority Ports in Tonga		Fiji Ports		Cook Islands Ports		Kiribati Ports	
	Vt	\$	T\$	\$	F\$	\$	NZ\$	\$	A\$	\$
Load/Unload TEU (Full)	35,000	306.64	135 (partial)	57.23	150	72.92	247	178.75	250	193.11
Load/Unload FEU (Full)	50,000	438.06	270 (partial)	114.46	225	109.38	481	348.09	375	289.66
Load/Unload TEU (Empty)	21,000	183.99	65 (partial)	27.56	80	38.89	24.70	17.88	125	96.55
Load/Unload FEU (Empty)	35,000	306.64	151 (partial)	64.01	120	58.37	36	26.05	187.50	144.83
Berthing Charge (Container Vessel)	300 per meter per day	2.63 per meter per day	0.1296 per GT per hour	0.05 per GT per hour	2.72 per 100 GRT per hour	1.32 per 100 GRT per hour	0.41 per GRT per day	0.30 per GRT per day	5 per 100 GRT per day	6.18 per 100 GRT per day
Mooring Fee	13,000 up to 100 meters LOA or 16,000 for more than 100 meters LOA	113.90 or 140.18	0.80 per GRT	0.34 per GRT	0.286 x GRT + 1,048	0.14 x GRT + 509.47	1.29 per GRT per visit	0.93 per GRT per visit	8 per 100 GRT	6.18 per 100 GRT
Terminal/Wharfage Fee TEU (Full)	Nil	Nil	179	75.88	70	34.03	1.24 per cubic meter	0.90 per cubic meter	10 per cubic meter or tonne	7.72 per cubic meter or tonne
Terminal/Wharfage Fee FEU (Full)	Nil	Nil	358	151.77	98	47.64	1.24 per cubic meter	0.90 per cubic meter	10 per cubic meter or tonne	7.72 per cubic meter or tonne
Storage of Containers	No charge for first 5 days		No charge for first 5 days		No charge for first 3 days		No charge for first 8 days		No charge for first 21 days	

\$ = United States dollars, A\$ = Australian dollars, F\$ = Fiji dollars, FEU = forty-foot equivalent unit, GRT = gross registered tonnage, GT = gross tonnage, LOA = length overall, NZ\$ = New Zealand dollars, TEU =

2.5.8 Modernisation of Pacific Island Seaports

International connectivity at PIC's is reliant upon efficient seaports with sufficient capacity now and in the future. The main ports of entry play a vital role in the PIC economies and most operate as a natural monopoly and many act as a singular international gateway for nearly 100% of all physical freight movements in and out of the countries. In addition, the seaports deliver foreign sourced income directly to the PIC economies through port dues and charges on visiting foreign flag ships and cargo movements. The concentration of effort at a singular port node demands that it has to cater for a variety of ship and cargo operational requirements. Consequently, many PIC's ports shoreside infrastructure includes petroleum bulk storage tanks, external container yards for storage of full and empty and transshipment containers and unitized cargoes and vehicles, warehouses for unpacking and storage of loose goods, in addition, many PIC ports also provide shoreside facilities for a variety of fisheries related services and inter-island ferry services. Statutory services and other government agencies including customs, quarantine, immigration, and marine dept. police are also frequently housed within the port areas in PIC's.

Ports throughout the Pacific are expanding or upgrading their infrastructure and are extending their operational services to accommodate the need to meet increased demand for maritime transport. The demand for increased capacity at ports is imposed through greater volume of sea freight (increases in container volumes and tonnages of breakbulk freight) that require larger storage terminal areas. The other key demand for increased port capacity is the scale of ship size being deployed in Pacific island trade routes. It is correct to assume that shipping lines will only deploy ships that can physically be safely accommodated at ports, yet the pressures derived from economies of scale in ship size transfer to pressures to expand wharf length and increase depth in channels and alongside the quay. These pressures to expand port infrastructure are global and cascade down to smaller trade routes, (McKinsey & Company, 2017). An associated issue is the implications for ports that do not expand to sufficient scale may risk becoming relegated to a route served by smaller feeder vessels which by design have less container and freight capacity and may be less frequent in the number of calls per year, (Kavirathna, Kawasaki, Hanaoka, & Matsuda, 2018).

As mentioned in Section 3.2 a number of Pacific island ports have suffered from years of inadequate preventative maintenance funding resulting in early degradation. At some ports wharf structures have become inadequate and unsafe for continued load bearing usage, (World Bank Group, 2015). In some ports the degradation was so severe the port had to be abandoned and moved to another wharf location as was the case at Star Wharf in Port Vila Vanuatu. The newly constructed Lapetasi wharf at Port Vila (Figure 21) commissioned in 2018 is scaled to meet future design life needs over the next 50 years, (VPMU, 2018).

Figure 21 - Lapetasi Wharf and Terminal Port Vila, Vanuatu 2018 (VPMU, 2018)



In contrast, to the scalable port and wharf designs allocated to recent port developments such as that at Lapetasi wharf, see Figure 21 are those which are arguably over scale to the long-term demand profiles.

One such case was that of Vaiusu Bay in Samoa. This port design was created by Shanghai Construction Group and China Harbour Engineering Company (CHEC), see Figure 22 in 2016 that presented a port design capacity for 300,000 TEU, (PECC, 2016). The most recent annual container throughput volumes at Apia port Samoa shown in the Samoa Port Authority (SPA) Annual Report were 41,200 TEUs, (SPA, 2020). Indeed, the Apia port redevelopment had only just concluded being undertaken by JICA and commissioned in 2018, (Matatia, 2018).

The design scale presented by CHEC could be considered extremely inappropriate and the associated build cost estimated at USD100 million would have significantly added to Samoa's exposure to external foreign debt. Samoa's new prime minister has opted not to proceed with a China-backed port development project (RNZ, 2021). According to the new Prime Minister, Fiame Naomi Mata'afa, government officials confirmed the project had not gone beyond feasibility testing and that it exceeded Samoa's requirement and would not be a priority with (Samoa) government, (RNZ, 2021).

Figure 22 - Vaiusu Bay Port Development Project CHEC / SC Group 2016



In addition to port redevelopment needed to keep pace with increased trade volumes and ships of larger dimension are those ports that require relocation from their original site. The original site of most Pacific island ports was selected on the basis of natural protection from prevailing weather and simultaneously with proximity to the centre of commerce and eventually the centre of government. The town and seaport firstly had an interdependence which in some cases switched to one of competition for available land as the commercial townships became urban business districts, places of central government and tourism centres. In many cases the port faced restrictions not only from limited available land with which to expand operations but also from the presence of urban landscape around it and constrained road access.

This global phenomenon is not new and has witnessed wholesale relocation of near city ports to greenfield sites that are removed from urban spaces and offer large areas of industrial zoned land for future expansion. In addition, these greenfield port sites are chosen based upon their hinterland connectivity unhindered by urban arterial land traffic, (Yehuda, 1982). Pacific ports that have signalled their need for relocation away from their original site are; Suva port in Fiji and Honiara port in the Solomon Islands. Other ports in less populous states are less affected by the urban sprawl that adversely encroaches on port operations and creates in compatibility between the two landscapes.

New port infrastructure constructions are planned or underway in many port locations (Section 5; Summary of major international port-related infrastructure projects) with designs that are, for instance, likely to increase the use of diesel-based vehicles and engines involved with handling equipment and materials. These upgrades, along with the potential increase in vessel traffic, could create additional environmental, social, and economic issues. However, they also represent opportunities for developing environmentally sustainable ports in the Pacific. This is not limited to, but particularly relevant for the region's fight against climate change.

Greening of port activities are being addressed by varied methods including the establishment of pricing incentives on ship and cargo port users that consistently lower their carbon emissions, mitigation of light spill,

noise and vibration from port activity. Innovative technology and management techniques are being applied to enhance the monitoring and mitigation of pollution from ports.

2.6 Domestic connectivity

2.6.1 Overview

Domestic shipping remains an essential service to connect people, services, and freight to outer Islands.

Widespread deregulation of domestic shipping occurred in almost all PIC's and in those countries that have large scale need for domestic shipping are mostly dominated by the private sector. These private sector actors own and operate their own vessels and have their own management and crewing and fuel/service their ships using local inputs. In some PIC's there remains government run domestic shipping services including Samoa, Tuvalu, FSM, Kiribati, and Tonga, (JICA, 2018). In such regimes the ship (ferry) assets are donor funded and purpose built which reinforces the designed safety of assets yet may also 'crowd out' the private sector from competing against an incumbent with donated capital assets, see Figure 23, (JICA funded Samoa ferry).

Overall, the domestic shipping sector in PIC's provides the economic base of a maritime services cluster. This can be seen occurring in PIC's where skills and training takes place in a maritime circular economy. Very few studies have attempted to research this and define the economic benefit of domestic shipping especially the involvement of private sector participants. It may be well founded to undertake such studies to define the benefits and where the host countries may need further support to develop maritime sector service clusters. A regional effect may also emerge where cross training and sharing of regional services may be advantageous.

Figure 23 - Typical Purpose-Built Passenger Ferry Samoa 2016 (AMSTEC Pty Ltd)



2.6.2 Franchise Shipping Schemes

Much has been done to assist with increasing a sustainable coverage of domestic shipping to outlying islands with sparse populations and low volumes of freight and passenger demand. Notably the Franchise Shipping Schemes (FSS) pioneered by ADB had assisted to deliver consistency of shipping coverage to remote outlying populations that were financially unattractive for commercial shipping operators to provide regular direct calls. Various vessel types including landing craft were taken into the FSS as shown in Figure 24.

The lessons learned from FSS operations were published by ADB and summarised difficulties in structuring contracts that are commercially attractive to bidders, need to enhance contract monitoring, difficulty of operators to access finance for vessels, dependency on the ability of the governments to commit to funding

franchise shipping programs and vessels financed through government grants disrupting competition (ADB, 2017).

Such FSS schemes were subsidised campaigns that had finite donor budget funding, after which exhausted the schemes were handed over to government departments to manage and finance. Such schemes have not either been carried forward under government management or been scaled back in line with host government budget constraints. It may well be a benefit to investigate the extent of positive outcomes from such schemes and identify quantified commercial lessons to be learned.

Another thought is that these subsidised shipping schemes provide the direct subsidy to the ship operator - whereas in some global regions the subsidy (compensation) has been paid to the users of the ship in the form of an equalisation of freight charges align to those charged for main services that do carry or need a subsidy. It may well be the case that this research and examination of global alternatives applied to shipping schemes may assist with future thinking on how best to engage on such subsidised domestic transport allocation of funding for PIC's, (DITRC, 2021).

Figure 24 - Typical Franchise Shipping Vessel Vanuatu 2018 (AMSTEC Pty Ltd)



2.6.3 Domestic Ship safety

There are many issues of deficiencies in the implementation and compliance of maritime safety - both at international and domestic levels in PIC's. Investigations into government policies and shipping registries in the local domestic shipping sector remain as a recurrent need associated with recurrent maritime accidents that involve loss of life and property, pollution, and damage to national reputation.

In some instances, limited resources in the government administrative sector results in the deficiencies in training to provide comprehensive ship inspections for maritime safety compared with international standards. Lack of repair and maintenance facilities may be another cause of these safety deficiencies. This may be one of the reasons why there are variations to local regulations applying to vessels of different size and capacity and thus slipway inspections.

There is likely benefit in an updated regional study to identify the need for slipway repair and maintenance services and ship repair facilities, (PSDI, 2019). Such research should aim at the need for statutory surveys of commercial domestic vessels, hull cleaning and inspections, refitting and modifications, emergency repairs after collisions, groundings or other incidents and where aging vessels might need to be de-registered or registered in a category that denies their ability to carry passengers.

Overloading and vessels departing port when adverse weather warnings have been declared are cited in various reports as ongoing concerns associated with domestic ship safety (World Bank Group, 2015). In April 2020 twenty seven (27) people died when the MV Taimareho sank in rough seas whipped up by Cyclone Harold, which was then a category two, (RNZ, 2021), see Figure 25.

Equally significant aspects of domestic ship safety are analysed in detail and provided in Section 3.4.

Figure 25 - MV Taimareho 1 at Honiara Port prior to departure (AMSTEC Pty Ltd 2019)



3 KEY ISSUES FOR MARITIME CONNECTIVITY AND THE SUSTAINABILITY OF PORTS IN PACIFIC ISLANDS

This section presents an overview of key issues in the ports and maritime sector, some examples, and some suggested opportunities for responses. The issues are categorised as:

- **Regional network integration and coordination** – including network efficiency, supply chain resilience, and freight costs.
- **Sustainable and resilient ports infrastructure** – including ageing and inadequate infrastructure, the ‘build-neglect-rebuild’ paradigm, vulnerability to climate change and natural hazards, port design and location and urban encroachment.
- **Border security** – including the challenge of meeting international requirements for port security across multiple dimensions.
- **Domestic connectivity** – including end-of-life boats with high running costs, recurrent maritime disasters, safety challenges, lack of infrastructure, and low service levels and viability.
- **Port operations** – including difficulties to monitor and fairly compare port productivity, governance and management at ports and a need for a managed approach to investment in digitalisation
- **Financing** – including overly optimistic planning assumptions about economic viability, dependence on aid, limits on borrowing due to high risk of debt distress, undercharging for ports services, and inadequate budgeting for maintenance and repairs.
- **Sector governance** – challenges in sustaining consistent effectiveness in governance over the maritime sector in both administration and operational activities. Strengthening fiscal process management at ports and support for greater private sector involvement in port operations and investments.
- **Legal frameworks** – including coordinated approach for consistent support for rule of law in maritime matters with emphasis upon the need for adoption of appropriate maritime treaties and promptly converting same into national laws.
- **Human resources and capacity** – including a small pool of people, lack of access to training, low management capacity, and low participation of women in the sector.
- **Marine pollution** – including the sensitivity of PICs’ coastal environments and the lack of capacity to prevent or respond to pollution.

3.1 Regional network integration and coordination

Regional integration and coordination of the maritime transport network

The Pacific islands shipping networks retain elements of inefficiency that lack economies of scale. Most core international container shipping networks concentrate on linking a fixed number of ports and each network is independent from the other. In many cases these networks are long standing in their design and applications and have changed little in the last few decades. Mergers and acquisitions between Pacific islands shipping companies have further concentrated the control of shipping capacity (An, 2021).

Cross-ownership between shipping companies further dilutes the innovation of network shipping dynamics. Ship space sharing agreements on Pacific island routes between international shipping lines lowers the need for competitive tension and may contribute towards the scaled investment approach. The combination of these elements suggests that Pacific shipping networks are mature with monopolistic traits. Integrated connectivity planning that looks at shipping and ports, including domestic connectivity is a valuable addition to the specific works undertaken of PIC’s transport sectors in recent years.

Development of regional hubs

It can be said that every port has a desire to become a transshipment hub port. This itself is a worthy concept based upon increasing throughput and revenue for the host port authority. Yet, the reality is that not all ports within a network can become transshipment hubs. Indeed, the definition of a hub port requires that other ports are relegated to a dependency status.

The recognised definition is “a large port that is intended to attract transshipment cargo to and from smaller ports is termed a ‘hub’ port—because it effectively acts as a ‘hub’. Hubbing refers to this process” (ADB, 2007).

Networks currently based upon on services that can be characterised as traditional ‘milk runs’, suggest that a regional sectoral approach has been adopted in the selection existing sets and sub-sets of hub ports. An integrated approach that addresses the overall volumes, capacity and origin/destinations will create efficiency in the overall network of shipping routes and in theory lower unit costs (Ducruet & Notteboom, 2012). It has recently been noted that a non-geared container ship of 4,250 TEU capacity will make an inaugural direct call at Lae port in Papua New Guinea. The ambition for Lae port to become a Pacific hub port is defined in the ambition of the concessioned terminal operator ICTSI (James, 2021).

Supply chain resilience, risk assessment and preparedness

PICs regularly experience natural disasters which brings severe disruption to supply chains, (Burkhardt, 2020). At the same time access to emergency goods such as potable water, fuel, food, medicine and building supplies becomes critical as often fresh water sources are contaminated, crops destroyed, and power outages are commonplace. There is little redundancy built into the maritime transport network through many PICs. This is shown relative to closure of some main ports impacted by operational accidents and severe weather and seismic events. An example is August 2014, ship berthing incident ‘damaged the Nauru Mooring System. 8 months later the moorings had not been repaired, so no phosphate export since August 14’, (PRIF, 2015).

The arrival of COVID-19 and closing of borders across the Pacific brought dramatic changes to aviation operations and introduced challenges to shipping logistics, taking into account the different quarantine requirements of countries, (WFP / Logistics Cluster, 2021). New Zealand MFAT carried out an analysis of the key vulnerabilities in the maritime supply chains and provided targeted support to anticipate and address any issues and avoid critical shortages across the Pacific region, (NZ MFAT, 2021). The COVID-19 impacts are still being felt throughout Pacific Island supply chains. The most recent examples of pandemic impacts declared include evidence of international supply chains and marketing opportunities for Fiji, Solomon Islands and Vanuatu export industries were negatively impacted (Davila, et al., 2021). The loss of tourism revenue in the Cook Islands, Fiji, Palau, Samoa and Vanuatu is predicted to result in no or even negative economic growth in 2021 as a result of a decline in tourism numbers (ADB, 2020).

Vulnerabilities and risks identified included limited storage capacity, limited frequency of resupply, critical equipment in varying states of maintenance. An example of a critical vulnerability, Niue is critically dependent on a few items of major plant for collecting and distributing containers and loading and unloading cargo ships, including a 55-tonne crane, container forklift, truck and trailer, and workboat. The same equipment is also used in other applications across the island, but in 2018 there was no back up equipment, a lack of scheduled maintenance, no replacement process, and a lack of trained operators. Niue’s National Transport Strategy identified the crane, in particular, as a critical part of the supply chain without which it would be impossible to launch the workboat or lift containers. As a result, the government put in place a maintenance schedule for that plant and considered replacement strategies (Reeves, 2018).

Some major plants can have a long lead time and require difficult logistics to replace (Reeves, 2018). As these vulnerabilities are common across the Pacific, a regional approach by development partners to monitoring these vulnerabilities and having systems that can respond quickly might make sense.

Freight rates, maritime transport costs and consumer prices

Inherent higher costs due to low trade volumes, long indirect routes to reach distant markets (travel time and fuel costs), empty container returns, inefficient ports and port congestion all contribute to substantially higher costs – at the same time, it is a mature shipping market with little challenge to the incumbents, so there is no competition pressure to ensure prices are fair, (UNCTAD, 2014). While freight rates are high compared to global rates, they are in line with the true costs of delivering low-volume, remote services (ADB, 2007)

Two different approaches have been tried in the Pacific to manage freight costs while ensuring frequent and reliable services. The first is to create government-run shipping lines. An example of this is the Pacific Forum Line established by 12 Pacific Forum countries in 1978 as a government-led service to ensure regular, modern shipping that encourages economic development. In the first two decades of service, the line attempted to provide increased services and broad coverage that was not financially viable. In recent times the line operates on a commercial basis as a subsidiary of Neptune shipping, with coverage limited to main ports in larger PICs.

(ADB, 2007) (Neptune Pacific Line, n.d.). In August 2020 the Government of Nauru commenced a single vessel service - Nauru Shipping Line (NSL) (Nauru Govt., 2020), which resulted in the existing commercial shipping line withdrawing from direct services to Nauru.

The second approach is to regulate the entry of competition, with the aim of working in partnership with those incumbents to ensure reliable service, adequate frequency, and reasonable costs. The primary example of this is the Micronesia Shipping Commission (MSC), with the Central Pacific Shipping Commission (CPSC) established in 2014, (SPC, 2018). It is apparent from discussions with some stakeholders that there is hope these cooperative mechanisms can work to improve services and reduce costs, but there has been no real review on how best to achieve these outcomes through Shipping Commissions that charge license fees to international shipping lines and monitor service levels and ocean freight rates.

In 2020 and 2021 during the COVID-19 Pandemic, there has been a global surge in demand for container shipping combined with container shortages and port congestions. This has led to a surge in global container freight rates, reaching record highs (UNCTAD, 2021). Pacific island states have not been immune from these effects and impacts to service level frequency and higher pricing, mostly through imposition of surcharges has been reported, (UNCTAD, 2020).

3.1.1 Responses/ Opportunities

The existing international shipping networks are designed by and for the benefit of the international liner companies that form alliances and consortia. The networks may not deliver ideal solutions for the Pacific island states they serve. The World Bank's Blue Transformation for Maritime Transport in the Pacific Advisory Services and Analytics (ASA), see Section 6.2.1, which is currently underway may serve as a pathway to collaborate in identifying beneficial hub port and regional and sub-regional networks that afford better frequency and transit to the host countries.

- Improve regional networks - region-wide, strategic approach to network planning;
- Promote larger scale hub port connections – particularly from North East Asia ports;
- Transshipment hub port connections attracting large cellular container ships plying north-south routes would create economies of scale that would filter down to connecting services to Pacific island ports;
- Support for more transparency and regional oversight of carriers' practices in routing, scheduling, and pricing – in particular freight surcharges which contribute to total cost of landed good prices;
- Promote equity around the frequency and affordability of services - Collective regional approach to port charges and licensing – this could be a task of SPC or joint tasks with regional organisations;
- Policies and coordination – technical support for sub-regional shipping commissions such as the CPSC and the Micronesia Shipping Commission;
- Monitor and address critical supply-chain vulnerabilities region wide – there could well be value in a regional approach to address critical supply chain disruptions by creating an emergency response capability in neighbouring states.

3.2 Sustainable and resilient ports infrastructure

3.2.1 Issues

Port infrastructure designed with emphasis upon international trade

Significant investment has been undertaken in PIC port infrastructure and equipment in recent years, designed mostly to improve the efficiency of port operations, expand, and improve infrastructure resilience to severe weather conditions and rising sea levels. (McMahon, 2021).

Most recent externally supported studies have concentrated upon specific elements of individual PIC's international maritime transport components. Mostly these core development plans are focused on infrastructure, which itself being important omits to take account of the whole transport network dependency, including degraded domestic wharves and hinterland networks serving the port that have become congested.

An example of this is the specific expansion of the wharf and terminal at Point Cruz, Honiara port in Solomon Islands.

The expansion of the international terminal was a requirement under a country wide assessment of international freight demand forecast for 20 years. The port expansion caters to the scale of larger vessels and increased containerised throughput, yet value would be derived from consideration of hinterland connections in Honiara. The majority of containerised freight is trucked from the international port to through the central city west to Ranadi industrial zones, (PRIF, 2012). It is understood that private sector participants have considered funding a new port development at Ranadi that would compete with the SIPA facility.

Inadequate and ageing infrastructure

As stated earlier, many Pacific Island ports have challenges related to legacy infrastructure that requires modernisation and upgrades to provide capacity for larger vessels and greater payload and volume of freight. The large-scale infrastructure developments highlighted in Section 5 requires funding at levels that impact PIC's borrowing capability, (IMF, 2020). As such the capital values and cost benefit of port infrastructure developments require careful consideration.

In many situations capex investment decisions are made to purchase 2nd hand ageing equipment that has an immediacy of recurrent repair and maintenance costs far above that new equipment would afford and adds to the cost by needing to import additional spare parts. It could be claimed that such decisions are a false economy and give rise to equipment failures which lowers productivity and efficiency at the ports they serve, (World Bank Group, 2015).

A general lack of major cargo shoreside handling plant means international ship operators are driven to employ relatively expensive, geared container vessels (ADB, 2007). This reliance on ship cranes at many Pacific island ports moves the balance of control towards the international shipping lines who provide the specific type of self-geared ships. Port provide ship-to-shore cranes would in theory attract non-geared cellular container ships and potentially provide increased levels of flexibility and competition and options for increased transshipment activity and lowering of unit prices. This theory applies when the entire liner route is supported by sufficient ship-to-shore cranes.

The 'build-neglect-rebuild' paradigm in PICs

Inadequate infrastructure maintenance in PICs is a well-described and understood problem. The failure to maintain and manage infrastructure – including ports – leads to premature deterioration and results in infrastructure being unserviceable and in need of major rehabilitation before the end of its planned life. There is a great 'infrastructure debt' in PICs representing the gap between what has been spent on infrastructure and what should have been spent (Alejandrino-Yap, Dornan, & McGovern, 2013). De Sitter's Law of Fives for concrete structures estimates the cost of this neglect as between 5 and 25 times the cost of doing routine maintenance (de Sitter, 1984).

The maintenance of infrastructure is dependent on the availability of funding, the capability of staff and the incentives for staff. A prevalent problem in PICs is the failure to set aside adequate funding for maintenance, poor forward planning capability, a lack of trained and skilled maintenance staff, and weak internal management systems. The problem has been allowed to continue to a large extent through donor projects that privilege the construction phase of an asset and give inadequate attention to the asset management liabilities of that infrastructure, compared to the capacity of the country to manage it. (Alejandrino-Yap, Dornan, & McGovern, 2013)

Vulnerability of ports infrastructure to climate change and natural disasters

Port infrastructure is particularly exposed to natural hazards and to the impact of climate change due to their locations along open coasts and close to sea level. Sea level rise, cyclones, heat waves, extreme winds, storm surge, tsunamis and flooding rise all risk damage to port assets and equipment, as well as connecting roads, disrupting port operations (Kim & Ross, 2019).

This is particularly important for PICs due to the high dependence on long and quite vulnerable supply chains, (PRIF, 2021) and the increased exposure of PICs to these climate impacts, especially through increased frequency and severity of storms (Riku & Kato, 2021).

Port infrastructure is long-lived, and it is important for PICs to plan carefully now so as to avoid locking in the risk. Reducing risk should also consider the vulnerability of domestic hinterland and sea connectivity. Infrastructure-related adaptation responses may include the location of the port infrastructure, engineering design of the deck (for example, to be more robust to extreme seas), layout to better facilitate operations in high-wind, or redundancy of wharves and handling equipment, example is the redevelopment of Nuku'alofa port Tonga, (ADB, 2020). Any major rehabilitation or rebuild port projects in the Pacific need to take climate change impacts and natural hazards into account – although it should be noted that there are non-infrastructure responses to these risks that may be more appropriate (PIANC, 2020).

Port design and interface with urban areas

Historically, towns were built around ports. Subsequent urban growth and development often means that ports are integrated into city centres. The heavy reliance on trucks causes traffic congestion, air pollution, noise, and light pollution (UN ESCAP, 2021). For some ports, such as the Suva port in Fiji, encroachment of urban areas also restricts expansion and redesign of the port to better suit modern demands and thus is forced to relocate, (ADB, 2017).

Many Pacific island ports occupy their original site and have design attributes suited to the age of loose cargoes and conventional break bulk shipping. However, as described earlier in this report shipping has been transformed and dominated by containers since the 1970's. Consequently, some Pacific island ports carry forward legacy issues as their design is built for smaller breakbulk volumes and not for containers. This fact also applies to the backup areas and often overlooked condition is the hinterland connectivity which in some instances forces large trucks through urban areas to access the port, (PRIF, 2012).

Urban encroachment describes the situation where a port becomes operationally constrained by the impacts and proximity of urban buildings, roads, dwellings, and community services. This is a well-documented condition, yet many Pacific port studies have not fully covered such an important issue. Ports within port-city dynamics where conflicts arise between existing land use as a port and proposed city land use, e.g., for housing or waterfront development. Such conflicts could become particularly intense if urban development encroaches upon port development, making it difficult for port to expand their activities. Cost differentials of the port site and alternative port sites refer to land prices (considering scarce land availability in cities), but also costs for other production factors such as capital and labour, which could drive port developers and market players to look for alternative, less urban new port sites, (Sammons, 2018). Port development close to cities might relate to stricter environmental regulations close to cities. Impacts of noise, air quality, energy consumption, waste management and dredging could be scrutinised more closely in urban areas than in more remote areas, (Notteboom, The adaptive capacity of container ports in an era of mega vessels The case of upstream seaports Antwerp and Hamburg, 2016).

3.2.2 Responses/ Opportunities

Strategic and master planning

A significant aspect of port infrastructure investment is the planning to ensure its adequacy in design and application. This investment decision criteria is best mapped using a masterplan approach that pays attention to all the components of the transport network across the entire nation. This is particularly important process for island states with connecting domestic services and road networks that traverse urban environments.

- Port Master Planning establishes strategic policies and guidelines over the medium to long term to direct the future development and/or relocation of the Port, (PIANC, 2014).
- Evaluation of urban encroachment and hinterland access to ports in all future studies involving port development in Pacific islands. Value benefit to 'port specific' projects is required to evaluate urban encroachment including truck transits through the city centre to access port facilities.
- The concept that the port is part of the entire national and regional supply and value chains that contributes to benefits and disbenefits is an elevated strategy well worthy of carrying forward into future evaluations of such developments.
- National transport planning- ensure coherence and consistency in decision-making across the national transport sector.

- Strategic planning - Strategic planning identifies projects of national importance – prioritisation.
- Spatial planning – locality – in context of climate change and urbanisation – most appropriate place for heavy infrastructure port- components of decision- connection with hinterland transport and specific category assessments of:
 - Multi-hazard risk assessment – considering urban and commercial hinterland areas
 - Urban encroachment, domestic connectivity – considering impacts of expanded port infrastructure on the existing community and future town planning
 - Climate change, long-term lock-in measures that mitigate risk to the ports operations
 - Available space – potential for expansion that considers future long term demand forecasts and how to provide the required increased port facing land areas.
 - Future demand and profile of demand, ship types – consideration of the vessel types and profiles that will enter trade routes and potential changes to vessel port needs.
 - Future-looking – 50 year design standards to cater for new tech fuel storage – e.g., hydrogen or ammonia..
 - Integrated spatial and infrastructure planning – cross sectoral stakeholder and community engagement in port master planning.

Port design and construction

- Climate resilient design such as raised decks, seawalls, or floating wharves
- New infrastructure, or major rehabilitation offers the opportunity to design for resilience – for example, considering future sea level rise before selecting a site, choosing heat-resistant building materials, or ecosystem-based measures such as protecting nearby mangroves to absorb storm surge (Kim & Ross, 2019)
- Port deck layout can be designed to accommodate unstacking in preparation for containers for cyclones and storms, to avoid being toppled by high winds.

Green ports

- ‘Green port’ is a term used to describe the uptake of a range of measures that increase a port’s environmental sustainability, in areas of resource consumption and reducing negative environmental impacts. Measures include reducing energy use, switching to renewable energy, reducing water consumption, electrification of handling equipment (such as forklifts), management of water, noise, and light pollution, and managing impacts of traffic on adjacent areas. (Port Authority of New South Wales)
- The implementation of green ports measures in PICs must be fit-for-purpose and dependent on the appetite and capability of the port to implement such measures. Many measures are simple to introduce and will have short paybacks, such as higher efficiency air conditioning in offices, energy efficient lighting, and energy conservation behaviours.
- Appropriateness of responses for PICs for measures such as pollution control of ships while they are in port. There is often a gap between what ‘should’ happen and what is possible given limited financial and human resources, and the difficulty of enforcement actions.

Asset management – maintenance and budgeting

- Long-term performance-based construction and maintenance contracts to enhance the sustainability of ports assets over their lifetime (Baker & Campbell, 2021) can facilitate private sector involvement and capability building (Alejandrino-Yap, Dornan, & McGovern, 2013)
- Improve budgeting at a national and sub-national level – consider Reservation funds/ earmarked funding (Alejandrino-Yap, Dornan, & McGovern, 2013)
- Longer donor project lifecycles – oversight of asset maintenance to ensure appropriate budgets and asset management plans are secured long term

- Longer term support for institutional capacity building or supplementation – in concert with above, benefit would be realised with experts assigned to the port authority to assist with training and mentoring alongside the port staff responsible for financial and engineering management.
- Better donor coordination – aligns to outcome focused coordination between donor parties.
- Donors to ensure that governments are fully cognisant of the asset management and replacement liabilities at the time of establishing a project (Baker & Campbell, 2021)

3.3 Border security

3.3.1 Issues

International ports and terminals have to fulfil the requirements of the UN-IMO International Ship and Port Facility Security Code (ISPS). The ISPS Code is a comprehensive set of measures to enhance the security of vessels and port facilities, developed in response to the perceived threats to vessels and port facilities in the wake of the 9/11 attacks in the United States, (PIANC, 2014).

Pacific island ports that are mostly multi-users and multifunctional have faced challenges across the varied dimensions of port security and access especially those that host regular container ship, cruise ship and tanker ship visits.

Pacific island ports have had to fund developments and enhance their staffing to comply with ISPS code requirements. These developments include; upgraded perimeter fencing, installation of security cameras and monitoring systems, upgrades to terminal lighting, increased numbers and competence of security staff and implementation of regular checks and system testing. Obligations of the port facilities involve, among others, undertaking Port Facility Security Assessments (PFSA), developing Port Facility Security Plans (PFSP), designating Port Facility Security Officers (PFSO), and ensuring that training and drills take place regularly. The designated PFSO is responsible for developing, implementing, and maintaining the PFSP, (Port Security Center , 2021).

Additional pressure on Pacific Island ports have come from the need for monitoring of security operations, installation of new information technology, human resource administration and increased labour hire has placed additional efforts on Pacific island ports management resources and budgets. In 2007, the port industry was asked to estimate the direct initial "one-off", and the annual "recurring" expenditures required to comply with the requirements of the ISPS Code, (UNCTAD, 2007).

Assessments of the cost associated with the compliance of the ISPS code reveal the implementation and operating expenses can be a substantial part of the overall costs to the port authority / operator. The findings from (UNCTAD, 2007) stated that initial cost figures can be as high as US\$ 50 million per respondent government, while annual costs can reach US\$ 27 million for port compliance with the ISPS security code.

International shipping has also had to bear costs associated with implementation, observance, and compliance of the ISPS code. Ship security, already controlled to high levels, ship security had to be enhanced under the ISPS code. This included ship security plans (SSP), amendments of old plans and training of crew to ship security officer certification and the testing and assessment of ship security onboard. The responsibility for ISPS ship security is the ship owner / operating company. The ISPS applied to ships on international voyages over 500 GRT which meant the code applied to limited numbers of Pacific island fleet ships.

As an international arrival venue, the port needs to provide facilities for; biosecurity / quarantine, immigration, customs, and revenue authorities. In some circumstances Pacific ports have an inadequate supply of port zoned land and utility services with which to facilitate and house on site statutory authorities. As a priority the ports need to reach formal agreement with the statutory agencies to ensure compatibility with the port's land use needs and the statutory needs of the agencies. Without such formal understanding there may be future disputes and intervention at ministerial levels.

Container inspection facilities are the areas required by non-commercial port users, most notably the statutory authorities listed above. Recent development with donors granting equipment for some ports. These inspection facilities include an X-ray screen facility usually mobile which the customs authority will man and operate. A quarantine and customs area for storage of confiscated cargo and containers may also be required.

The additional land use and deployment of high-tech equipment may impose a significant burden on a port that has limited resources and limited spare land area to turn over to non-commercial uses.

3.3.2 Responses/ opportunities

Most international ports and international ship operators/owners have implemented surcharges to their tariff charges on users to compensate for the additional costs highlighted above. Pacific Island ports have been slow to apply such charges or in some cases have not added additional surcharges to the scale of user fees. These tariff arrangements would allow the ports to self-fund ongoing security expenses and demonstrate self-sufficiency in modern port management. Potential extends for regional support from existing organisations to also be partially funded by the ports

- Regional support for a standardised evaluation and checklist approach to port facility security requirements (to prepare ports for official audits) regular checklist evaluations to include:
 - Port facility security plans
 - Port facility security officers
 - Certain security equipment
 - Monitoring and controlling access
 - Monitoring the activities of people and cargo
 - Ensuring security communications are readily available
- Support for evaluation of needs assessment for X-ray equipment installation at Pacific ports given the additional land, resources and demands in places within the port zone.
- Inclusion of statutory agencies needs into master planning and port expansion assessments.
- Regional support of audited procedures and processes to ensure compliance with ISPS.
- Assistance with evaluation of additional costs associated with ISPS compliance and the options to implement into port tariffs a scale of user charges to recover such associated direct costs.

3.4 Domestic connectivity

3.4.1 Issues

End-of-life vessels

Due to lack of access to capital, domestic ship operators usually purchase the cheapest vessels, often at or near the end of their operating life. These may not be fit for purpose and, due to age and condition, will have high maintenance and repair requirements. Weaknesses in maritime regulation and enforcement, lack of repair facilities, difficulty accessing spare parts and poor standards in workmanship mean these will often be poorly maintained, increasing operating costs and breakdowns, and posing a serious safety risk. (Weinstein, 2015) (Secretariat of the Pacific Community, 2015).

Lack of appropriate infrastructure

Many outer islands lack appropriate docks or jetties for boats to unload cargo or disembark passengers. In some cases, transfer is done from the interisland vessel to a smaller boat or raft, which is very dangerous unless seas are calm, and is not accessible for older people and people with disabilities. An example of this is Betio and London Ports in Kiribati, that have no domestic passenger and cargo terminal facilities to facilitate assembly and dispersion of passengers and freight, and to protect cargo prior to vessel loading, (World Bank Group, 2015).

This deficiency of domestic port infrastructure is also recognised in some main port centres. Often symptomatic of the high volumes of passenger and freight demand at domestic jetties and terminals. An example of this is the congestion experienced at Honiara domestic port where large numbers of passengers crowd the narrow wharves and foreshore especially at peak seasonal travel periods.

Planning of sufficient capacity at domestic shipping jetties and terminals can sometimes be miscalculated. This is perhaps a symptom of priority effort placed towards international assessments needs. An example of this was the temporary facility to serve domestic shipping in Port Vila which was sited at the south-eastern shoreline of Pontoon Bay featuring a floating barge to serve as a tidal ramp landing. Domestic vessels were initially planned to stay at this temporary facility for 18 months and shift back to the new domestic facility once completed at South Paray wharf. However, delays to domestic wharf construction have seen this temporary facility used for over 3 years, (Daily Post News, 2019).

Safety

The poor condition of equipment and poor oversight of the domestic maritime sector has led to disasters including: the deaths of ninety-five people when the MV Butiraoi sank in Kiribati in 2018, (RNZ, 2019). The most recent being in the Solomon Islands with the MV Taimareho which sank between the capital, Honiara, and Malaita April 2020, after it set sail despite cyclone warnings which killed 27 people, (RNZ, 2021).

One of the worst domestic maritime tragedies in recent years was in Tonga, August 2009 with the sinking of the Princess Ashika ferry in which 74 people were killed. In both cases subsequent criminal charges were laid implicating the operators and authorities, (The Library of U.S. Congress , 2010). Recommendations for improving maritime safety are also a result of the inquiries into these events. The published report - Improving Ports and Maritime Shipping' by World Bank defines the core issues as 'The absence of a safety culture, as well as the unsuitability of vessels built and/or donated for the Pacific island region, passenger and cargo overloading, ship-to-shore transfer of passengers, ferry accidents, limited search and rescue (SAR) response assets and capability, poor asset maintenance and lack of adequate maintenance facilities, and lack of passenger and cargo terminal facilities, are major challenges to improving maritime safety, (World Bank Group, 2015). Safety at sea for domestic shipping and at domestic ports remains at priority matter for the Pacific islands governments and their people.

Ensuring adequate services

Much has been done to assist with increasing a sustainable coverage of domestic shipping to outlying islands with sparse populations and low volumes of freight and passenger demand. Notably the Franchise Shipping Schemes (FSS) pioneered by ADB had assisted to deliver consistency of shipping coverage to these remote populations that were unattractive for commercial shipping operators to provide regular direct calls at, (DA-ADB, 2017). As described in Section 2.6 subsidised FSS campaigns had limited funding have either not been carried forward under govt management or been scaled back in line with budget constraints.

3.4.2 Responses/ opportunities

- High priority programs that have consistent funding and mandate. These would be managed by MDB's aimed at; The improvement of domestic maritime safety being a high priority for many PICs. The needs for this include training, regulatory support, development of legislation, education for community and for artisanal fishers, and provision of navigation aids and safety devices.
- Pacific Islands Domestic Ship Safety Programme (PIDSS) has been a regional response to addressing lingering issues in domestic shipping by advocating legal, institutional, and cultural changes to promote safety. PIDSS has been piloted in Kiribati, Tonga, and Vanuatu, which are among those countries that experienced major recent maritime accidents. A lack of funding has, however, limited the expansion of PIDSS to other PICTs.
- Coordinated approach between MDB's targeted towards domestic maritime safety, picking up on the listed strategies declared by World Bank, (World Bank Group, 2015).
 - Regional strategies such as PIDSS, SAR Technical Arrangement for Cooperation (TAfC) in place
 - Experiences from ongoing donor program can be leveraged and replicated (e.g., New Zealand Ship to Shore projects)
 - Apply lessons from aviation sector
- Investigate the extent of positive outcomes from Franchise Shipping schemes and identify any lessons to be learned. Another thought is that these subsidised shipping schemes provide the direct subsidy

to the ship operator - whereas in some other regions the subsidy (compensation) has been paid to the users in the form of an equalisation of freight charges align to those charged for main services that do carry or need a subsidy. It may well be the case that this research and examination of alternative shipping schemes may assist with future thinking on how best to engage on such domestic transport allocation of funding for franchise shipping schemes.

3.5 Port operations

3.5.1 Issues

Inefficient port operations

The matter of port operational efficiency is often underestimated in terms of impact to the host countries economy and the cost of living to its population. Obscured by the inability or lack of resources to properly measure port productivity in Pacific islands means there is very little genuine research that has been undertaken to understand and address the issue.

Globally, the importance of port productivity remains the domain of private sector port and terminal operators. This is arguably the case due to imperatives of these large terminals to report their efficiency which is measured against concessioned contract targets, driven by competitive pressures, and ultimately judged by these private corporate shareholders in terms of turnover, return on assets and market share.

Inefficient port operations in Pacific islands have been recorded in many instances in case studies of specific ports and countries. There has been very limited work to address the regional comparison of port operational efficiency and benchmarks that cause congestion and increased costs to users. Users include not just the ship and ship owners, but also and arguably more importantly are the importers and exporters who rely on efficiency at the ship side and also the cargo yards, port gate, port services and clearance procedures.

One modern era Pacific port productivity assessment was that completed in 2016 by ADB managed Private Sector Development Initiative agency (PSDI, 2016). This report benchmarked regional port productivity and tariffs and found some ports were underperforming in port services compared to neighbouring countries. The study researched and recorded port pricing tariffs and productivity through a number of Pacific island ports. The PSDI study outlined a range of measure that could be undertaken immediately to improve performance and adjust ports charges in line with a regional standard. Other studies have included the 2016 ADB Trade and Transport Facilitation in the Pacific which overlayed multiple technical studies involving aviation and maritime transport designed to conduct regional analysis of trade and transport linkages aimed at initiatives to enhance trade competitiveness, (ADB, 2019).

More recent studies in the Pacific islands have been less specific in their application of research of port productivity with the latest being the PRIF Pacific Infrastructure Performance Indicators (PIPI's) (PRIF, 2021), This wide-ranging report covers energy, waste management, information technology, water, sanitation/hygiene, and transport sectors. This report covers a limited number of countries has data unavailable and omits several key measures. It measures a few key indicators including:

- average vessel turnaround time (days)
- delay waiting to enter ports (days)
- average number of container movements per hour.

For smaller ports with low volumes and infrequent ships, the efficiency of operations at the ships side and at the terminal and cargo receipt and delivery are important elements of the supply chain. Investments in infrastructure alone will not address or realise improvements in operational productivity and efficiency.

In concluding this important subject, the research works of transport experts summarises the importance of this matter; The price of the vast majority of traded goods is exogenous for developing countries. If the shipping of imports becomes more expensive, higher prices ensue as a result of the increased cost of imported goods; in the case of intermediate and capital goods, this also increases the costs of local production. If exports become dearer to ship, the result is a drop in earnings for the exporting country or simply the loss of a market, depending on the elasticity of demand and the availability of substitutes. Econometric estimates suggest that the doubling of an individual country's transport costs leads to a drop in its trade of 80% or even more, (Limao & Venables, 2001).

Digitalisation of Port Operations

UNCTAD and ESCAP anticipate that a fast shift towards digitalisation will widen the divide between developed and developing countries with a particular impact on under-connected countries such as those in the Pacific. (UNCTAD, 2021). This needs to be evaluated against the ultimate outcomes of port-based digitalization System (UNESCAP, 2021)

Digitalization in a ports setting refers to the digital transformation (or digitalization) and integration of information technologies into business processes, changing how they operate and deliver value to their customers – port owners/operators, service providers and their users. There are many suppliers of technical systems including consulting firms and software developers which promote these integrated transport systems (also known as Port Community Systems). Digitalization proponents and developers are increasingly promoting the involvement of cloud computing, blockchain, autonomous transport and artificial Intelligence in port management systems, (Elnaz, 2020).

The reasons to transform to digitalization is aimed at improving supply chains with the support of IT systems. The development of collaborative platforms will help to enable service providers to invest in self-service systems to improve the ease of doing business for customers. For example, cargo booking systems, cargo tracking systems, and invoicing, to become paperless and available online. The ultimate objective behind these digital systems is to have staff perform only the tasks that the systems cannot do, such as exceptions. This implies staff moves towards new managerial, commercial, and programming roles as basic logistics tasks are automated, (Notteboom, Pallis, & Rodrigue, 2022 release date).

Based upon the above definitions and expert projections of ultimate usage, the shift to digitalization needs to be carefully considered as to its application in Pacific island ports integrated transport setting.

3.5.2 Responses/ Opportunities

As indicated above, the status and sophisticated nature of digitalization has evolved exceedingly quickly in global port settings. The relevance and benefits of implementing scalable digitalization at Pacific ports needs to be handled with sensitivity towards the overall impacts. These impacts include; development and management costs, traditional employment numbers at ports, suitability, and sustainability of digitalization systems in Pacific island settings and identification of defensible cost benefits.

It can be argued that parallel focus may be more advantageous in the near term to evaluate management systems that include efficiency, safety, and green ports initiatives. Indeed, some of the basic elements of digitalization can be included across several components of pre and post implementation of green ports, especially in the monitoring and evaluation of power savings and flow on benefits of port/urban interface.

Support the implementation of improved management systems

Integration of scalable elements of digitalization systems aimed at efficiency improvements in basic port operations should be evaluated to achieve quick wins that can be quantitatively measured against dwell times on cargoes in container yards. Direct and indirect benefits to importers and exporters can be identified in such monitoring and evaluations.

Including digitalisation where this is suitable and can be managed in a Pacific port setting is important. Consideration that ports with very low volumes and/or low management capacity needs particular attention and sensitivity to ensure the most suitable and practical investment approach is taken.

3.6 Financing

3.6.1 Issues

Assumptions about infrastructure enabling economic development

The Pacific is one of the most aid-dependent regions in the world, with many PIC countries reliant on aid for the operation of governments. Development partners have often funded assets on the implicit assumption that the provision of infrastructure will facilitate economic growth and be able to pay for itself (Alejandrino-Yap, Dornan, & McGovern, 2013), and yet, with few exceptions, the special character of PICs means this is not the case.

In general, low asset utilisation means it is difficult to pay off investments and there is low or no profitability in smaller ports, example being Funafuti port, Tuvalu with an annual throughput of approx. 5,000 TEU per annum, (SPC, 2021). Port fees in the Pacific islands are generally low compared to peer ports in other regions and the shipping monopoly means there is unequal bargaining power between shipping companies and ports authorities on port charges. Governments typically fail to allocate enough funding to cover maintenance costs. The true cost of providing the port services, taking into account asset maintenance, against the realisable revenue, may not be understood and so the shortfall (required subsidy) is not quantified or budgeted for. This point is sustained in many Pacific island ports research and assessments including that of JICA, ADB and World Bank, (ADB, 2007), (World Bank Group, 2015), (JICA, 2013).

Official development assistance (ODA)

Official development assistance (ODA) to Pacific island small states is some of the highest in the world (on a per capita and national income basis) (Dornan & Pryke, 2017). ODA doubled between 1999 and 2019 (adjusted for inflation) (OECD Development Assistance Committee (DAC), 2021) and will further increase with commitments to climate finance, and with funding to support economic recovery from COVID-19, with a focus on sustainable and resilient infrastructure. The scale of investment, while needed to address the infrastructure gap (See 3.2.1), challenges the absorptive capacity of PICs. There are relatively few major development partners in ports and maritime connectivity in the region, with Japan previously, and now the ADB and the World Bank taking the lead on major projects.

Financing maintenance and rehabilitation

One estimate of the cost of maintaining existing infrastructure in the Pacific is around 3.1% of Gross Domestic Product (GDP) (Alejandrino-Yap, Dornan, & McGovern, 2013). Typically, development partners have provided loan or grant financing for the construction phase of infrastructure projects, with the country being responsible for the ongoing cost of maintenance and repairs. While little information is available, it is widely understood that maintenance is not being carried out, resulting in higher costs for rehabilitation or rebuilding (as set out in 3.2). To some extent, this is based on an actual resource constraint and the problematic assumptions about economic returns, but even where there are adequate resources, there is often a failure to allocate funds from national budgets. (ADB, 2007) One final consideration is that often country governments accept the project to develop infrastructure without being fully cognisant of the ongoing costs and responsibilities – these are often not adequately captured, or accurately estimated, in the design documents. In recent years, there are examples of development partners placing more emphasis on capacity building for better maintenance budgeting and asset maintenance practice, but it remains a challenging issue.

Debt sustainability

Several PICs (Kiribati, Federated States of Micronesia, Marshall Islands, Samoa, Tonga, Tuvalu) are considered to be at high risk of debt distress (World Bank, 2021) which restricts their ability to access debt financing, in most cases making them eligible for grant-only assistance from the ADB and World Bank.

Revenue generation

In many Pacific Island ports settings, there is only one designated international port, (PRIF, 2021) and in all PICs there are no competing operators in the provision of international ports. As such these are natural monopolies yet remain charging for port services based on historical tariffs.

The ports and other maritime services are mostly governed under legislation that stipulates the ports should operate in a manner aligned to and as fitting to a commercial enterprise. Some ports are profitable and pay a dividend to their host national governments. Whereas some ports are break-even or have suffered from financial distress in the last 10 years and some do not pay dividends. An example of this the Samoa Ports Authority that entered a period of financial distress in 2012-2014, (Parliament of Samoa, 2014).

The legislation covering port authorities' commercial activity allows the ports to adjust pricing as they see fit. Unfortunately, many PIC ports have a regime of adopting a legacy port pricing tariff that was created at the same time the Port Authority was created - circa. 1960-80.

These legacy pricing documents may well benefit from modernisation and a formula-based approach to price increases - driven by the real costs of capex and opex and inflation. There are port pricing formula standards for berthage and wharfage and pilotage etc. that can in theory be translated and adopted by PIC's thus

enhancing their potential earning ability, profitability and thus payment of annual dividends to the shareholder (govt).

The benefit of this is manifold; port charges are paid by foreign shipping lines and importers and exporters; the largest value is direct charges allowing foreign owned ships to use the Pacific island ports. In theory payments to the Port Authority are thus foreign income - cash from foreign source earnings, helping with balance of payments. Some ports in developing countries also charge in USD rather than in local currency, (SSATPP, 2013).

Primary source of revenue from shipping lines for the Port Authority are: berthage and line handling; anchorage; wharfage; navigational fees; pilotage; security; environment and levies associated with safe and secure workings of the port; lease and concession income from land and service agreements; and penalties associated with non-compliance and violation of port rules and regulations.

Ports in the Pacific are undercharging in a global context – in general current quantum of charges is about one third lower than say, Sydney or Auckland international port charges, (PSDI, 2016). The argument against increasing port charges in Pacific island ports is attached to concerns that inflation in costs to importers and exporters will be substantial. This argument needs to be fully evaluated based on actual costs of facility and services as in container trades it is considered that port charges are a small proportion of overall cargo costs, (Slack & Gouvernal, 2011). Over time incremental increases to Pacific island port charges will reach regional levels consistent across region, (PSDI, 2016).

3.6.2 Responses

- High-quality, country-driven, sector strategic planning, programme-based approaches, and alignment of donor investment supports the absorptive capacity of countries to manage increased investment and leads to more relevant and effective investments.
- Planners should make realistic assumptions about the economic viability of ports projects, and better estimates of the ongoing level of subsidy required.
- Ongoing maintenance and rehabilitation costs should be estimated during the design phase of an infrastructure project so that the country stakeholders can accept a project with full knowledge of the liabilities.
- Improve budgeting at a national and sub-national level – consider Reservation funds/ earmarked funding (Alejandrino-Yap, Dornan, & McGovern, 2013)
- Review of port charges/ opportunities for ports revenue and establishing port charges benchmarked on a regional basis
- Allocation of subsidies from government or donors to ensure there is funding for maintenance and rehabilitation.

3.7 Sector governance

3.7.1 Issues

Good governance is a vital precondition to reduce the vulnerability of small island states, (UNCTAD, 2016).

The ADB defines the term ‘good governance’ on its development context, as “the manner in which power is exercised in the management of a country’s economic and social resources for development”, (Mellor & Jabes, 2004). In a broad scenario, governance is meant to enhance and foster the institutional capacity of the government in order to create strong coordination between partners of government, state, private and civil society, (Huffer & Molisa, 1999).

There are challenges associated with creating a unified approach to sustaining a model to support good governance throughout the maritime sector in the Pacific. Such challenges are succinctly defined in the UNESCAP study (UNESCAP, 2019) that states; the with diversity in governance models and management arrangements in port and supply chain business “poses a problem for the development of systematic responses to negative impacts”.

Latent social conflicts and weak institutions exacerbate the effect of external shocks to an economy, (UNCTAD, 2019). Weak institutions have been identified by many PICs as a key impediment to investment and economic growth, (Gani & Prasad, 2006). For PIC's to fully integrate in the world economy and to benefit from outward oriented trade strategies, the functioning and quality of institutions are important. For example, ill functioning institutions can hinder trade, (Anderson, Trade and informal institutions, 2001), bad institutions can reduce the volume of trade (Anderson & Marcouiller, Trade and security, 2001) and openness and quality of institutions are most likely to exhibit bidirectional causality (Dollar & Kraay, 2003).

As the responsibilities for oversight and management of maritime matters at ministerial departments and divisions has transition to autonomous authorities, government owned enterprises and corporations many have struggled to sustain appropriate levels of governance. Institutional infrastructure has been constrained by lack of appropriate levels of public expenditure and necessary skilled directorship. Trade as an engine of growth requires particular attention is provided to developing the appropriate institutional mechanisms that support both regional and global integration of the economies. The main benefit expected out of this integration is expected to be enhancement of trade. Appropriate and quality institutions would support the PICs endeavour to enhance trade, (Gani & Prasad, 2006).

Sector structure

The maritime and ports sector can be defined as being in its secondary stage of evolution, given that port authorities in most Pacific island states commenced their mandated status in the 1980-90's. The Samoa Port Authority (SPA) was created by an independent act of legislation in July 1999. It was set up as a pilot profit-making commercial organization to see whether or not the self-funding model would be successful, (World Bank, 2006).

Even more recent were the creation of maritime safety authorities in Pacific island states, with Fiji announcing the establishment of the Maritime Safety Authority of Fiji (MSAF) in 2011. Laws enacting the powers of MSAF allow it to act as the regulator responsible for Fiji's maritime safety, protection of marine environment, regulation of search and rescue and also hydrographical services.

Even more recent have been the establishment of maritime safety authorities in other Pacific islands. The Office of the Maritime Regulator (OMR) Vanuatu began operations in 2017 and the establishment of the Solomon Islands Maritime Authority (SIMA) in 2020, after a period of transition from an administrative office. The new Vanuatu OMR replaced the Vanuatu Maritime Authority (VMA) that was disbanded after the VMA Act was repealed in 2007. The closure of the VMA is an example of poor governance at Pacific maritime institutions with evidence that, immediately after the closure of the VMA there was confusion for the administration of the main Acts and inadequate provisions for the delegation of power to key persons, (ADB, 2010).

Private sector participation

Privatisation of ports and their operations remain long-term decisions that affect security and sovereignty of Pacific islands countries. Yet the involvement of the private sector in maritime transport and ports is globally recognised as providing long term advantages. These advantages have been defined in the Landlord Port model as, allowing private investors to effectively meet customers' demand, and the state to balance its investments and limit resources dispersion in ports and increase profit and/or enhance competitiveness. Likewise private sector full involvement allows private investors to actively invest in building market-oriented seaports and developing policies for seaport charges in an appropriate way, (UNESCWA, 2019).

Involving private sector participation in maritime and ports also allows for the potential transfer and development of good governance and management skills. The often-cited mechanism that produces good results for both government and private investors is the public-private partnerships (PPP) arrangement. The PPP by its own needs extend the strengthening of institutional mechanisms across the range of management regimes right to board and chairpersons reporting levels as well delivering formal training and staff exchanges.

3.7.2 Responses/ Opportunities

Institutional capacity building is an often-over-used statement - the "institutional capacity" levels within PIC maritime sectors has attracted many and varied approaches and techniques of many bilateral government and

MDB technical assistance programs. Often the assistance only identifies the needs and does not activate the practical on-the-ground support. Proposed responses are as follows;

- Create a pathway and mechanism to contribute to improving management and performance of Ports Authorities and Maritime safety administrations by inserting experts into their management to help guide a reform process aimed at embedding critical methods and processes at operating levels and at board and at senior management levels.
- This may also involve re-defining organization structure with appropriate staffing levels, redesignating staff responsibilities and accountability.
- Administration - Support for good record keeping and monitoring evaluation processes and reporting.
- Support for fiscal management - enhancing fiscal management of budgets and enhanced revenues and cost-effective services through improved arrangements.
- Other assessment and institutional capacity building would best be aligned to implementation of debt controls, introduction of best practice accounting management.
- Divestment proposals for non-performing assets, reduction of fixed and variable costs/ expenses, and asset management
- Support for greater private sector involvement - providing assistance to finalize a PPP Strategy policy for the maritime sector as well as an integrated approach to monitoring PPP performance and outcomes.

3.8 Legal frameworks

3.8.1 Issues

The matter of legal and regulatory frameworks is a complex and specialist subject, especially in the maritime and ports setting.

In developing countries, the overriding matters of concern center upon; the efficacy of legal and regulatory frameworks. This depends upon the depth of capacity and resources to enact laws, have the correct procedures and resources to interpret and monitor the laws and regulations and have the procedures and resources to challenge and prosecute noncompliance.

The summarised definition of the legislature is the machinery of government, and public administration, covering the law-making process, civil service, local government, and the overall policymaking and implementation frameworks of laws. The legal and regulatory framework, assessing the extent to which the rule of law is manifested in the legal and regulatory regimes that govern interactions between government institutions and its citizens. Another aspect of legal and regulatory frameworks is the strength and effectiveness of the judicial system itself. This covers the degree to which the rule of law is manifested in the operations and effectiveness of the judiciary through the court system, the appointment and remuneration of judges and magistrates, the independence of the judiciary, and the efficiency and effectiveness of the system, (Law and Justice Foundation, 2021).

International conventions

In the Pacific island setting some of the challenges include the ability to transfer international maritime organization (IMO) treaties or any such amendments into local laws. When a nation adopts a new regulation or amendment before it can enforce such application on board ships or at its ports it must first enact those IMO treaties into its local laws. This involves drafting the appropriate implementing legislation as IMO treaties are not self-executing and require domestic legislation to give effect to their provisions, (IMO, 2021).

There have been instances where Pacific island states have lagged in their timeliness to adopting treaties and drafting the appropriate implementing maritime legislation and pass such into laws at the national level. Laws that govern the global shipping industry, such as the International Convention for the Prevention of Pollution from Ships, state that individual nations can pursue insurers to pay up in the event of pollution from ships. This was the case in the Solomon Islands when the ship MV Solomon Trader struck a reef in February 2019 off the remote Rennell Island nearby to a World Heritage listed site and leaked around 75 tons of heavy fuel oil into

the ocean, (UNESCO, 2019). The problem faced by the Solomon Islands Government was at that time it was not a signatory to those conventions, putting the country in a difficult position. Reported by legal experts; "The Solomon Islands cannot go directly to the insurer, so the only entity they can look to is the ship's owner, what the case makes clear is that in the international shipping circles it's very difficult to get a hold of the ship owner and whether the ship owner has any other assets other than the ship", (Sawhani, 2019).

Since this incident the IMO has worked to provide definition and advice to the need for ratification and effective implementation of conventions relating to oil pollution preparedness, response, and co-operation (OPRC) – hosting virtual workshop on the subject, (IMO, 2021). It remains the responsibility of the state to adopt treaties, create and enforce the national laws in a timely and effective manner.

Certain regional and intergovernmental organisations are promoting and assisting Pacific island governments with their commitment to work with partners to ratifying and or meeting the requirements of these IMO conventions, noting their importance in protecting the marine environment and humans from ship sourced pollution, (SPREP, 2019). Other regional partners include SPC that support PICs by providing policy and legal advisory and drafting assistance to help effective maritime policies and laws that align with relevant international instruments and that PIC's have suitable maritime governance frameworks to regulate their domestic maritime transport sectors, (UNOCHA, 2021).

Domestic legislation

As the legal and judiciary systems are complex and require highly qualified resources the loss of trained staff is a common feature. Inadequate capacity building in legal services, coupled with the loss of senior staff who have management and technical skills, is common in many Pacific island states.

Another matter for legal systems to manage in Pacific island settings is the special nature and importance of tradition and custom in their constitutions, such matters are otherwise left to the elders and chiefs. In Vanuatu the National Council of Chiefs in 2001 was considering the drafting of a bill in which oral "laws" would be codified, with external assistance. There have been calls to formally recognize the status and contribution that the chiefs may make to improving governance and public officials' behavior. In most countries the role chiefs may play in the judicial system is unclear, (Mellor & Jabes, 2004).

There are also challenges to ensure sufficient skilled investigative staff are directed and employed during needs of inquiries and investigations on the maritime sector. Legal drafting is another area of weakness because senior officials do not provide adequate instructions from a policy perspective to ensure consistency and predictability of the legal, regulatory and policy framework, (Mellor & Jabes, 2004).

Monitoring and enforcement

The monitoring and enforcement of maritime legislation is yet another complex and specialist task in the maritime setting. In the Pacific islands this again becomes challenging due to limited resources of trained and qualified staff and thereafter retention of such staff and resources. Funding is another key factor in sustaining the effectiveness of monitoring and enforcement.

As detailed in this report there are only three Pacific island states that have autonomous maritime authorities that act as regulators of the maritime sector, an important role is enforcing safety compliance with domestic ships. Of central concern is the capacity for the legal system to conduct transparent and effective inquiries. The maritime tragedy involving the sinking of the ferry Princess Ashika in Tongan territorial waters in August 2009 resulted in the death of 74 people, (Legislative Assembly of Tonga, 2010). The subsequent inquiry was beset by problems including claims by Tonga's Attorney-General (AG) at the time, saying the government had attempted to interfere with the inquiry into the Princess Ashika tragedy, (ABC News, 2010). The Tongan AG subsequently resigned in April 2010 citing the decision by the cabinet "not to support" the appointment of independent prosecutors to prosecute matters regarding the sinking of the MV Ashika, "on the spurious grounds of the lack of funding", (NZ Herald, 2010).

3.8.2 Responses/ Opportunities

- Align with other partners and sustain multi-lateral support. In 2014, a Framework for Pacific Regionalism (FPR) was formally endorsed at the Forty-fifth Pacific Islands Forum, this included Strengthened governance, legal, financial, and administrative systems, (UNESCO, 2018).

- Assistance to review the efficacy of the machinery of government, and public administration, covering the law-making process, civil service, local government, and the overall policymaking and implementation frameworks of laws for the maritime sector.
- Assistance to review the efficacy of the legal and regulatory frameworks, assessing the extent to which the rule of law is manifested in the legal and regulatory regimes that govern interactions between government and the maritime institutions and maritime stakeholders;
- Support for further improvement to the enabling environment of legislation, policies, and frameworks for emerging and new technologies for the maritime sector
- Support and recognition for expert entities that provide technical assistance - DLA Piper provides longstanding pro bono commitment to supporting the rule of law in Pacific island nations. As part of this, the firm develops the legal knowledge and skills of lawyers from countries including Fiji, Vanuatu, Solomon Islands and Tonga to help them better assist their local communities' access legal help, (DLA Piper, 2019).
- Support and technical assistance for a regional forum and advisory center on Maritime law and compliance. This may be aligned with or separate to other programs hosted by SPREP / SPC.

3.9 Human resources and capacity

3.9.1 Issues

Limited human capital

PICs are characterised by small populations and therefore limited human capital, with this constraint being particularly apparent in the micro-states. Remoteness and small size also mean that local education opportunities are limited and there is a severe lack of highly specialised skills. Management skills and capability therefore vary widely across SIDS, in accordance largely with the size of population, economic base and the proximity to education. Outmigration is a common trend amongst many PICs as people who are able, move to Australia, New Zealand, or the United States for better access to economic opportunities, healthcare, and education. For example, the latest census data from the Marshall Islands shows the national population has decreased by 26% in the last decade (Johnson, 2021). Limited opportunities for employment in islands and offers of higher paying work (both skilled and unskilled) in Australia, New Zealand or the United States contributes to outmigration of skilled professionals, often referred to as 'brain drain' (Graue, 2019).

Training and education

Several PICs have maritime training institutes providing basic training for seafarers and port staff at varying levels, underpinning compliance of national maritime operations with international requirements. These institutes operate at varying levels of effectiveness. The Regional Maritime Programme run by SPC in the past supported coordination and networking of these institutes (SPC, 2006) but this review of publicly available information did not reveal any current programmatic support across the region. At least one of these institutes, in Tonga, was not functioning for several years. On the other hand, the institute in Kiribati is successful and trains seafarers for employment in international shipping.

Management capacity). Participation of women in the sector

Capacity for higher-level roles in management and governance of the ports and maritime sector is highly variable across PICs, but, in general faces, deep constraints and often relies on expatriate employees (with notable exceptions

As for many sectors traditionally seen as male, women are underrepresented in the global maritime sector, representing only 2% of 1.2 million seafarers. In the Pacific, women represent less than 10% of the estimated 16,000 people working in the maritime sector and occupy mostly administration and mid-level management roles (SPC, 2019). Yet women can make a valuable contribution to the workforce at all levels, including providing talent in the management and leadership roles. While there are women leaders in the sector, obstacles – both physical and psychological – remain (SPC, 2019).

The 2019 Regional Strategy for Pacific Women in Maritime (SPC, 2019) makes the case that bringing more women into the maritime workforce is positive for women and their families. It also makes the case that women in decision-making helps solve complex problems and foster innovation and improving an organisation's ability to adapt to a rapidly changing world. An example is the digitisation of the port industry which demands higher-skilled workers. This acknowledges that in many Pacific Island countries, more women obtain university degrees than men, which presents an opportunity for greater inclusion into the workforce.

3.9.2 Responses/ Opportunities

- Provide career opportunities for skilled PIC managers to attract them to the sector and retain them
- Greater investment in, and a regional approach to supporting maritime training institutes including educators, audits, and management support
- Provide managers with opportunities to do study tours and staff exchanges with peer ports in other countries
- Consider a pool of long-term, trusted specialist advisors that can assist PIC ports management and boards with a range of issues as needed to supplement in-country capacity
- Support for regional professional associations
- Promote regional strategy to achieve gender equality in the Pacific maritime sector (PacWIMA, 2021)
 - Recognition of leadership and contribution of women in the maritime sector;
 - Visibility of women in the maritime sector: and
 - Capacity building for women in the maritime sector.

3.10 Marine pollution

3.10.1 Issues

The Pacific islands are particularly susceptible to shipping's environmental impacts, due to the special value and sensitivity of their coastal environments and the current inadequacy of regional and national capacity to address marine pollution. The issues related to ship-sourced marine pollution in ports and coastal waters of PICs include:

- severe pollution of water and sediments in many ports in the region
- the leaching into the sea of toxic chemicals from anti-fouling paints on ships' hulls
- the disposal of ships' wastes (including waste oil, sewage, plastics, and other garbage) – most ports have inadequate facilities to receive ships' waste (SPREP, 2016).

The potential inaccuracy of navigation charts, poor standards of navigation aids, and low levels of training compared to other regions lead to higher risks of vessel grounding and sinking, which may can damage fragile marine ecosystems or result in catastrophic releases of oil and other contaminants.

Another significant issue is the translocation and introduction of marine species attached to ships' hulls and in ballast waters.

The capacity of PICs to prevent or respond to shipping impacts is very limited – most countries do not have adequate pollution prevention and response plans (SPREP, 2016). Several PICs are not Parties to the various conventions and protocols relating to the protection of the marine environment, including the MARPOL, London, and Noumea Conventions (SPREP, 2021).

One devastating example that illustrates the challenges of this is the grounding of a bauxite bulk carrier near the World Heritage site of East Rennell in the Solomon Islands in February of 2019. The Solomon Islands had little capacity to respond to the oil spill and prevent further damage, the ship charterer and ship owner, and a delayed response relied on deployment of resources from Australia (Osifelo & Martin, 2019). The damage was extensive, causing a direct loss of over 10 hectares of coral reef and economic losses of up to USD36 million

(Fox, 2020). Because the Solomon Islands is not a signatory to the relevant convention – the Bunker Convention⁵ – there was not a clear mechanism for compensation (Corrin, 2019).

3.10.2 Responses/Opportunities

- Updating navigation data including electronic navigation chart and nautical chart to prevent maritime accidents and support safe navigation
- Support for port inspections of ships and enforcement procedures
- Regional facilities for rapid deployment of response to major pollution events
- Support for improved implementation of international conventions (See 3.8).

⁵ International Convention on Civil Liability for Bunker Oil Pollution Damage 2001

4 KEY ACTORS, AGENCIES AND PROGRAMMES IN PACIFIC PORTS AND MARITIME CONNECTIVITY

4.1 Overview

There are myriad actors contributing to ports and maritime connectivity in the Pacific. The following section provides a brief summary of the role of key multilateral and bilateral development partners, regional agencies and programmes, and international agencies in the sector.

4.2 Multilateral development banks (MDBs)

The MDBs are increasing their attention to the issues of maritime connectivity and ports in response to:

- increased overall funding for the region
- increased attention to resilience to climate change and natural disasters
- discourse about the ‘blue economy’ opportunities for Pacific islands, and
- increased attention to the opportunities for low-emissions regional shipping due to advocacy from USP, Marshall Islands, Fiji, and other countries.

In the last few years, the World Bank and the ADB have provided by far the greatest support for ports and maritime connectivity in PICs with projects totalling around USD 1billion (see accompanying project inventory).

4.2.1 World Bank (WB)

The World Bank is currently financing major ports development in FSM, Marshall Islands, and Tuvalu, and domestic connectivity in FSM, Fiji, Marshalls, Kiribati, Tonga, and Tuvalu. The World Bank is also undertaking important regional studies and analyses of sustainable ports, connectivity, and sustainable shipping to identify the opportunities and needs across the region at both system-wide and program-specific levels.

Also under Decarbonizing Maritime Transport Phase 2 P177583- a workshop series for SIDS/LDCs will be delivered (incl. respective workshop summary reports) to enable selected IMO member states to develop joint position highlighting their specific needs, to take informed policy-decisions under the IMO, and to better understand the challenges and opportunities of zero-carbon shipping on their economies. This aims to improve awareness among SIDS/LDCs about the challenges and opportunities of low-/zero-emission shipping; Enhanced coordination among SIDS/LDCs to speak with a stronger voice at the IMO.

In 2020 The World Bank Blue launched The Blue Transformation for Pacific Maritime Transport Advisory Services and Analytics (ASA) project which aims to develop a better understanding of regional maritime connectivity in the Pacific and identify infrastructure and capacity gaps to guide second-generation maritime operations. The activities are designed to review and recommend pathways for improved logistics efficiency and reduced transport costs in support of passenger transport, fisheries, domestic and import-export supply chains and tourism industries; improved maritime safety; enhanced resilience to climate, pandemic crisis and natural disasters; and green port/shipping initiatives including decarbonization in the maritime sector. These program targets include:

(i) An assessment of international maritime connectivity between PICs and main gateway ports for efficient regional connectivity; (ii) A vulnerability assessment on safety as well as climate and disaster/pandemic resilience; (iii) A strategic needs assessment of immediate infrastructure priorities in the PICs to promote “blue economy” development, particularly in tourism, passenger transport, fisheries, and domestic and international trade. (iv) A green ports and supply chain logistics assessment for sustainability roadmap; (v) An evaluation of regional and national maritime sector institutions and policies to support strategic development plans; (vi) A detailed needs assessment and country-specific diagnosis for three countries (to be determined), built on the recommendations under the five activities.

These World Bank ASA activities are designed to identify maritime, port, and supply chain infrastructure, including last-mile connectivity, systems, and operational gaps to guide second-generation maritime operations to support the integrated and sustainable development of ocean economy sectors. This approach represents a departure from the traditional siloed sectoral planning and policymaking and aims to enable PICs

to better harness the potential of an integrated blue economy. If successful, this can provide a framework for cooperation with other partners going forward (see 6.2.1).

4.2.2 Asian Development Bank (ADB)

The ADB's recent and current projects include major port developments for the Cook Islands, Nauru, Samoa and domestic connectivity in Fiji, Solomon Islands and Tuvalu. The ADB is providing technical assistance for a strategic review of Suva Port and options for relocation.

ADB's goals for the Pacific in the period 2021-2025 include a specific focus on:

- Quality Infrastructure – provision of basic infrastructure and helping PICs to overcome the “build-neglect-rebuild paradigm by providing long-term support to help finance, manage and maintain assets sustainably; and
- Connectivity – continuing the ADB's focus on roads, ports, and airports, enabling expansion as transshipment hubs and strengthening regional cooperation and integration.

ADB is aiming to adopt a “Pacific Approach” to delivering projects that better takes into account the capacity constraints and relatively small size of projects in the Pacific. (ADB, 2021)

ADB also auspices the Pacific Private Sector Development Initiative (PSDI) in partnership with Australia and New Zealand. The PSDI promotes economic growth in the Pacific region through reforms that reduce the constraints to doing business and promote inclusive growth, entrepreneurship, and new business models. PSDI has assisted with more than 300 reforms since 2007 and is active in the maritime sector.

4.2.3 Pacific Region Infrastructure Facility (PRIF)

PRIF functions as a coordination and technical assistance agency and aims to help improve the quality and coverage of PIC infrastructure by:

- Working with members countries to identify priority national infrastructure project pipelines, and to support sustainable infrastructure management.
- Facilitating donor coordination among donors as well as with Pacific countries and key stakeholders.
- Providing technical assistance and capacity building support to member countries in infrastructure planning and management.
- Helping find best practice and the right technology solutions to infrastructure issues and to act as a knowledge hub. (Pacific Region Infrastructure Facility, 2021)

PRIF Partners include the Asian Development Bank, Australian Department of Foreign Affairs and Trade, European Union, European Investment Bank, Japan International Cooperation Agency, New Zealand Ministry for Foreign Affairs and Trade, United States Department of State, and the World Bank Group.

PRIF's Pacific member countries are Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Nauru, Niue, Palau, Republic of the Marshall Islands, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu. Papua New Guinea is an associate member. PRIF also works with other regional and international partners including several UN agencies.

Several specific streams of PRIF's work support sustainable ports and maritime connectivity in the Pacific:

- PRIF hosts a **Transport Sector Working Group** (see 6.2.2) of development partners to facilitate efficient networking, program coordination and consultation, and to identify priority initiatives and technical assistance to be incorporated into the annual PRIF work plan.
- Publication of *Pacific Infrastructure Performance Indicators* (McMahon, 2021) every 5 years.
- Support for the development of National Infrastructure Investment Plans that identify a pipeline of infrastructure projects for PICs.

4.3 Bilateral development partners

Australia has been the largest provider of development assistance to the Pacific region, followed by the United States, China, New Zealand, and Japan (Dornan & Pryke, 2017).

4.3.1 Japan

Japan typically maintains close on-ground relationships in PICs through local JICA offices in Vanuatu, Tonga, Solomon Islands, Samoa, Palau, FSM, Fiji, and the Marshall Islands and as a result develops carefully targeted projects in close collaboration with the country government. In the last two decades JICA has delivered significant port development projects in Kiribati, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu. Domestic passenger and cargo vessels were purchased for FSM, Marshall Islands, Samoa, Tonga, and Tuvalu.

4.3.2 Australia

Australia has a long-standing program to supply patrol ships to 12 PICs to bolster the maritime security of Pacific island nations, helping to protect their maritime environment, resources, and sovereignty. This program includes current upgrading of wharf facilities for the patrol boats, and ongoing maritime training. While not directly related to ports and connectivity, the program generally supports maritime-related capacity in the region.

Although PNG is not included in the scope of this report, Australia will support the development of PNG's ports infrastructure through the Australian Infrastructure Financing Facility for the Pacific (AIFFP) with potential investments estimated at AUD400 million (USD285 million). This will increase the capacity of PNG's commercial ports and improve trade and connectivity in the Pacific region. (AIFFP, 2021)

The AIFFP was established in 2019 to enable the delivery of high-impact infrastructure projects in PICs through AUD1.5 billion (USD1.07 billion) in loans and AUD 500 million (USD 356 million) in grants.

4.3.3 New Zealand

New Zealand maintains a significant aid programme to the Pacific, second only to Australia, but has a relatively small focus on transport and maritime. New Zealand's main focus in the area of maritime connectivity has been on domestic maritime safety in PICs. For the last decade, Maritime New Zealand, with funding and advisory support from the Ministry of Foreign Affairs and Trade (MFAT), have supported domestic maritime safety in Kiribati, Niue, Tuvalu, Tokelau, Cook Islands, Samoa, and Tonga. The support has been tailored to the specific needs of the individual countries and has included training, regulatory support, development of legislation, education for community and for artisanal fishers, and provision of navigation aids and safety devices. In addition, New Zealand is responsible for navigation charts for Tonga, Samoa, Cook Islands, Niue, and Tokelau and has recently upgraded these charts. There has been support for biosecurity and ports security in Cook Islands, Tonga, and Kiribati, and one infrastructure project for a domestic terminal in Port Vila.

During the COVID-19 pandemic, New Zealand conducted a vulnerability assessment of the regional supply chain, identifying and providing support to critical parts of the shipping and air freight system to ensure there were no critical shortages of food and medicine across several countries.

4.3.4 China

China has been involved in several projects in the Pacific related to ports including the expansion of Luganville Port in Vanuatu using debt financing, and the proposed, Vaiusu Port project in Samoa, which was cancelled by the new Samoan government. China is supporting the development of domestic jetties in Fiji with a grant, and has delivered port inspection equipment to Fiji, Tonga, and Vanuatu.

4.3.5 United States (US)

The US traditionally supports infrastructure projects in Palau, FSM, and the Marshall Islands under the Compacts of Free Association with these countries, but they do not appear to have a major role in ports and maritime connectivity in recent times.

4.3.6 Chinese Taipei

Chinese Taipei has carried out several smaller domestic maritime related projects in PICs with which it has economic ties. These projects include purchase of vessels and equipment in Kiribati and the Marshall Islands, and the expansion of fuel storage at the port in Kiribati.

4.3.7 Germany

Germany is funding one of the more innovative and successful programs in the region on sustainable domestic shipping – the Transitioning to Low Carbon Sea Transport (TLCSeaT) project which is developing low-carbon options for domestic shipping in the Marshall Islands.

4.4 Regional agencies and programmes

4.4.1 The Pacific Community (SPC)

SPC was established in 1947 as the principal scientific and technical organisation of the Pacific region. SPC delivers technical assistance, policy advice, training, and research services for the region. SPC has 26 Member States and Territories, including 22 Pacific Island Countries and Territories. Its programs span a number of sectors addressing sustainable economic development, natural resource and environmental management, and human and social development, including transport. In the past, SPC managed the Regional Maritime Programme which provided several key services to the sector including hosting support for regional sector associations, development of model legislation, and capacity building to implement international requirements including for seafarer training and port security (SPC, 2006).

Several key areas of SPC's current work relate to ports and maritime connectivity in the Pacific including:

- Hosting the Maritime Technology Cooperation Centre in the Pacific with SPREP (see 4.4.2)
- Secretariat for the Central Pacific Shipping Commission (see 4.4.7)
- Supporting the Pacific Women in Maritime Association (PacWIMA).

4.4.2 Maritime Technology Cooperation Centre in the Pacific (MTCC–Pacific)

In 2016, the IMO began an initiative to create a Global Maritime Technology Cooperation Centre (MTCC) Network (GMN) and set up MTCCs in five regions – Africa, Asia, the Caribbean, Latin America, and the Pacific – with four-year funding support from the IMO-European Union Project, Capacity Building for Climate Mitigation in the Maritime Shipping Industry. The MTCC-Pacific is being implemented by the Pacific Community (SPC) and the Secretariat of the Pacific Regional Environment Programme (SPREP). The MTCC aims to support targeted PICs in their efforts to reduce GHG emissions from the shipping sector and implement measures to optimize energy-efficiency through tools such as technical cooperation, capacity building and promotion of low carbon technologies and operations. In this regard, the MTCCs have provided technical training, completed pilot projects, and undertaken regional programmes of capacity building to help:

- Optimize capacity through raising awareness and improving compliance with international regulations on energy efficiency;
- Enable participating countries to develop national energy efficiency policies and measures;
- Facilitate greater uptake of low-carbon technologies and operations through pilot projects which in turn enabled implementation of energy efficient practices;
- Establish voluntary pilot data-collection and reporting systems to feed back into the global regulatory process to enable informed decision-making regarding energy efficient initiatives.

(Pacific Community (SPC), n.d.) (International Maritime Organization (IMO), 2021)

4.4.3 Pacific Blue Shipping Partnership

The PBSP is an 'open coalition' of eight Pacific Island countries—co-chaired by Fiji and the Marshall Islands with Kiribati, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu as members—who have announced an

ambitious commitment to accelerate development of a 100% carbon-free maritime transport sector by 2050, including a 40% reduction of greenhouse gas (GHG) emissions from shipping by 2030.

PBSP seeks to develop a blended finance package of at least USD500 million over 2020-2030. The money will be used for purchasing and retrofitting low-carbon ships that combine local design innovation and international technologies, building resilient and low-carbon ports, investing in new renewable energy generation and energy supply chains for regional shipping, and supporting education and training, capacity building, and national policy reforms.

The PBSP was previously supported by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and is currently receiving preparatory support from the World Bank. (The Pacific Blue Shipping Partnership, 2021)

4.4.4 Pacific Islands Forum Secretariat (PIFS)

The Pacific Islands Forum Secretariat supports Forum Members to work together in support of sustainable development, economic growth, good governance, and security. The PIFS does not currently have a particular explicit focus on maritime connectivity. (PIFS, n.d.)

4.4.5 Secretariat of the Pacific Regional Environment Programme (SPREP)

SPREP is the region's key inter-governmental organisation for environment and sustainable development. SPREP began as a joint initiative of the South Pacific Bureau for Economic Co-operation, SPC, ESCAP and the United Nations Environment Program in the 1970s, establishing as an independent intergovernmental organisation in 1993.

SPREP's role related to ports and maritime activities includes:

- Secretariat of the Noumea Convention (1986) which includes the Protocol for the Prevention of Pollution of the South Pacific Region by Dumping (1990) and the Protocol Concerning Co-operation in Combating Pollution Emergencies in the South Pacific Region (1990).
- Encouraging Members to accede to the IMO conventions relating to low carbon transportation, marine plastic litter from ships, hull fouling guidelines, and maritime compensation and liability (SPREP, 2019).

Development of regional waste and pollution management programmes that have included marine pollution and ports reception facilities (SPREP, 2016).

4.4.6 Pacific Island Development Forum (PIDF)

The PIDF was established in 2013 as the result of a Fiji-led regional process (the series of Engaging with Pacific Leaders meetings) in response to Fiji's suspension from the Pacific Islands Forum in 2009, and as part of a broader desire for sustainable development in the islands to be Pacific-led. The PIDF is focused on the 'green/blue economy' and sustainable development. From early in its establishment, sustainable shipping was on the agenda of the PIDF. (Tarte, 2015). PIDF has shifted from its original intention as a peak body for green/blue sustainable development in the Pacific, and now acts as a convenor in some specific projects.

PIDF has provided support to members for the Pacific's position on IMO negotiations around decarbonization of the global shipping fleet through training and advisory support.

4.4.7 Shipping commissions

Micronesian Shipping Commission (MSC)

The MSC was established by FSM, Palau, and the Marshall Islands in 1988, bringing together arrangements from the Trust Territory days to regulate shipping to these countries in order to maintain stable shipping services (ADB, 2007). At the 20th Micronesian Presidents' Summit (MPS) in Pohnpei in 2021 (the theme of which was "Sustainable Transportation and Trade Through the Micronesia Region"), it was agreed to bring Nauru and Kiribati into the membership of the Micronesian Shipping Commission (Clark, 2021).

Central Pacific Shipping Commission

The Central Pacific Shipping Commission (CPSC) is a sub-regional organization established in 2010 with the Marshall Islands, Kiribati, Nauru, and Tuvalu as members. Modelled on the Micronesian Shipping Commission, it aims to “encourage and promote an economical, reliable, safe and coordinated shipping service through regulation that meets the demand for international commercial shipping to these island nations.” SPC acts as the interim secretariat for CPSC. (SPC, n.d.)

4.4.8 Regional professional associations

Over the years SPC has provided support to set up and maintain various professional networks and associations in the maritime sector, listed below. The Pacific Women in Maritime Association (PacWIMA) appears to be functioning very well. Based on publicly available information, the status and functioning of most of the other associations is unclear.

Pacific Women in Maritime Association (PacWIMA)

PacWIMA was first established in February 2005 under the guidance of IMO’s gender programme for women in the maritime sector, with the assistance from SPC’s Regional Maritime Programme (RMP). After a hiatus of 6 – 7 years, PacWIMA was re-launched in April 2016 at a Regional Conference for Pacific Women in Maritime in Tonga with support from IMO, in collaboration with SPC. PacWIMA to date, has now seven (7) national women in maritime association established and operationalised, in Cook Islands, Fiji, Kiribati, Marshall Islands, Papua New Guinea (PNG), Solomon Islands and Vanuatu. (PacWIMA, 2021). The organisation has strong leadership and leads on the implementation of the Regional Strategy for Pacific Women in Maritime 2020-2024 (SPC, 2019).

Pacific Maritime Transport Alliance (PMTA)

The Pacific Maritime Transport Alliance (PMTA) is a regional association cooperation, friendship and understanding between member ports and port users through mutual alliances and the exchange of knowledge as well as the dissemination of information useful to port owners, operators, and users of port services. PMTA also promotes measures to increase efficiency and safety, facilitating harmonious development of ports in the region.

PMTA aims to host an annual Conference (the most recent conference was held in Samoa in 2019) and organises seminars on issues such as containerisation, maritime legislation, handling of dangerous goods, Law of the Sea, and digitalisation, and has organised a number of training exchanges for officials of island ports to Australia, New Zealand, or Fiji Ports. Regular members include port organisations from Cook Islands, Fiji, Norfolk Island, New Caledonia, Tonga, Tahiti, Tuvalu, Vanuatu, Solomon Islands, Papua New Guinea, Samoa, and American Samoa. Port organisations from Australia and New Zealand are associate members of the Association (Ports Authority Tonga, 2011). PMTA meetings are likely to have been disrupted by COVID.

Pacific International Maritime Law Association

PIMLA, established in July 2005, is the principal forum for legal professionals in the Pacific islands maritime sector to discuss and pursue legal maritime issues of concern to the region; advise international or regional entities and national governments to enhance the uniformity and harmonization of maritime practices; and promote maritime legal capacity building. The current status of this organisation is unclear from this literature review.

Pacific Islands Maritime Association (PacMA)

PacMA was the successor to the Association of Pacific Islands Maritime Training Institutions and Maritime Administrations (APIMTIMA), which was founded in 1995 with assistance from RMP. Up until 2005, RMP acted as the secretariat for the Association, organizing meetings and funding support. The current status of this organisation is unclear from this literature review.

Pacific Islands Shipowners Association (PISA)

PISA was established in 2012 as an association of shipowners from Pacific island countries and territories to jointly address long-standing issues for domestic shipping including safety. The current status of this organisation is unclear from this literature review.

Pacific Islands Maritime Conference (PIMC)

The first Pacific Islands Maritime Conference was held in Port Vila in 2016, with the support of SPC. The Conference was the official merger of PMTA, PIMLA, PacWIMA and PISA. The current status of this organisation is unclear from this literature review.

4.5 United Nations agencies

4.5.1 International Maritime Organization (IMO)

IMO is the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of marine and atmospheric pollution by ships. For the delivery of its programmes, IMO cooperates with a number of partner organizations in the region, including the Pacific Community (SPC) and the Secretariat of the Pacific Regional Environment Programme (SPREP). Additionally, IMO funds the post of an IMO Technical Cooperation Officer within the Pacific Community (SPC), based in Suva, Fiji.

4.5.2 Economic and Social Commission for Asia and the Pacific (ESCAP)

The ESCAP secretariat supports inclusive, resilient, and sustainable development in the region through supporting knowledge sharing, and by providing technical assistance and capacity-building services. ESCAP works in close cooperation with other United Nations entities and intergovernmental organizations in the region, across several areas including transport. ESCAP is considering how to better support PICs on the issues related with sustainable ports and maritime connectivity.

4.5.3 Conference on Trade and Development (UNCTAD)

UNCTAD was established in 1964 to promote the interests of developing states in world trade. UNCTAD has produced several studies looking at shipping and maritime connectivity in the Pacific.

4.6 Maritime training institutes

Most PICs have a maritime training institute, including Samoa, Tonga, Tuvalu, Solomon Islands, Kiribati, Vanuatu, Fiji, Marshall Islands and FSM. These provide education and training for seafarers to international standards, at varying levels. Some institutes are more sustainable than others and most are in need of support for funding, educators, and equipment. SPC provided support in the past for the maritime training institutes and supported a regional association, but the current status of that work is unclear.

4.7 Port managers

Ports in PICs vary in their arrangements and responsibilities from service ports where the state-owned port authorities own and manages all equipment and provides full maritime services to port users through to Landlord port operators whereby the ports authority has concessioned selected parts or the entire port operations to a private sector operator. As described fully in Section 2.5.3, Pacific island ports are legislated monopolies created when governments transitioned to independent states. As such they may benefit from an evaluation of how best to operate and exploit / and /or avoid the pitfalls of their own competition and consumer laws. The PIC region has only a few instances of where port concessions have occurred (Fiji/Vanuatu/PNG/Palau) making the Port Authority a formalised Landlord with subordinate port operators taking operational control of the port and terminal facilities. It is generally recognised that benefit is derived by transitioning to a landlord model at ports, this allows divestment of capex and recurrent opex and minimizing risks to govt owned enterprises. A Landlord port also allows the private sector to drive efficiency and productivity that creates national benefit for enhancing trade, (PPIAF, 2021). The reason to pursue private participation in ports is to generate funds for investment; increase efficiencies; and ensure cost-effective services.

At Pacific island ports there also needs to be consideration to avoiding monopolistic behaviour of private concessioned operators. As such a sound regulatory framework is necessary, but without preventing commercial entrepreneurship, (Van Niekerk, 2005).

5 INVENTORY OF DEVELOPMENT PARTNER-FINANCED PROJECTS IN PICS - SUMMARY

The tables below present a summary of major ports and connectivity related project in the Pacific over the last 10-15 years. Table 5 presents a summary of major projects related to international ports, and Table 6 presents a summary of projects related to domestic connectivity. A more comprehensive inventory database accompanies this report.

Table 5 – Summary of major international port-related infrastructure projects in PICS

Country/ies (or Regional)	Project name	Development partner/s	Location	Start year	End year	Completed, current or future	Cost USD (millions)	Funding amount, type, source (USD)	Activity type (i.e., construction, operations, policy etc)
Regional	Preparing Projects to Enhance Transport Connectivity and Resilience in the Pacific	ADB	Fiji (Suva port), Cook Islands (airport)	2020	2025	Current	5.5	5.5 TA (only a portion on maritime)	Project preparation for infrastructure
Cook Islands	Avatiu Port Development Project	ADB	Rarotonga	2008	2015	Completed	24.6	24.6m (20.2m loan, 0.8m grant, remainder CIG)	Infrastructure construction
Federated States of Micronesia	Federated States of Micronesia Maritime Investment Project	World Bank	Kosrae, Pohnpei, Chuuk, and Yap ports	2019	2024	Current	38.5	38.5m grant	Infrastructure planning, design, construction, and rehabilitation Institutional development/capacity building
Fiji	Fiji Ports Development Project	ADB	Suva and Lautoka Ports	1998	2007	Completed	36	16 ADB loan, 20m other financing	Infrastructure construction
	Port Security Inspection Scanner Project	China		2018			8.4	8.4m grant	Equipment purchase
	Assessment of current Suva port condition and operations – relocation	ADB	Suva	2020	2022	Current	2.3	2.3m grant	Suva port relocation assessment of new sites and cost estimates
Kiribati	The Project for Expansion of Betio Port	JICA	Tarawa	2010	2014	Completed	33.8	33.8m	Infrastructure construction
	KOIL's New Additional Fuel Storage	Taiwan	Tarawa	2012	2021	Completed	15	15m grant	Infrastructure construction

Marshall Islands	Marshall Islands Maritime Investment Project	World Bank	Majuro and outer islands	2019	2024	Current	33	33m grant	Infrastructure construction; equipment purchase; institutional development/ capacity-building
Nauru	Sustainable and Climate – Resilient Connectivity Project	ADB (with grants from Australia and GCF)	Aiwo, Nauru	2017	2022	Current	80	~ 80m (21m ADB grant, 14m Australia grant, 27m GCF grant and funding from Nauru)	Infrastructure construction; institutional strengthening
Samoa	Enhancing Safety, Security, and Sustainability of Apia Port Project	ADB	Apia	2019	2024	Current	75	75m (65m ADB grant, 13m counterpart)	Infrastructure construction; operational improvements; equipment purchase
	Enhancing Safety, Security and Sustainability of Apia Port	ADB	Apia	2018	2024	Current	75.03	62.26m grant Samoa Govt contribution 12.77m	Reconstruction of the breakwater, Acquisition of one new Tugboat, new X-Ray scanner, various superstructures, Green Port Initiatives.
	Second Development of Apia Port	JICA	Matautu Port, Apia	2015	2018	Completed	30	30m grant	Infrastructure construction, tugboat repairs and superstructures
Solomon Islands	Solomon Islands Land and Maritime Connectivity Project	ADB	Nation-wide	2021	ongoing	Current	171	171m (74.5m grant, 74.4m loan, 21.8 m Solomon Islands Government)	Infrastructure construction
	Project for Improvement of Honiara Port Facilities	JICA	Honiara	2014	2016	Completed	28	28m grant	Construction of a second international wharf and expansion of container terminal yard
Tonga	Nuku'alofa Port Upgrade Project	ADB	Nuku'alofa, Queen Salote Wharf	2020	2026	Current	50	50m (45m ADB grant, 5m counterpart)	Infrastructure construction; institutional strengthening

	X-ray Machines for the wharf and airport	China	Nuku'alofa	2019	2019	Completed	9.5	9.5m	Equipment purchase
Tuvalu	Maritime Investment in Climate Resilient Operations	World Bank	Nanumaga harbor and Funafuti port	2018	2024	Current	22.5	22.5m	Master planning; Infrastructure construction; Institutional strengthening; Contingency emergency response
	Improvement of Funafuti Port	JICA	Funafuti	2007	2009	Completed	5.6	5.6m grant (930 million yen)	Infrastructure construction
	Luganville Wharf Redevelopment	China	Espiritu Santo	2013	2017	Completed	93.4	80m concessional loan	Infrastructure construction
Vanuatu	Port Vila Lapetasi International Wharf Development Project	Japan/JICA	Port Vila	2012	2017	Completed	70	70m concessional loan	Infrastructure construction
	Container Inspection Equipment Project	China		2020			47	47m grant	Equipment purchase
	The Project for Improvement of Port Vila Main Wharf	JICA	Port Vila	2008	2008	Completed	15	15m grant	Infrastructure construction

Table 6 – Summary of major domestic connectivity-related projects

Country/ies (or Regional)	Project name	Development partner/s	Location	Start year	End year	Completed, current or future	Cost USD (millions)	Funding amount, type, source (USD)	Activity type (i.e., construction, operations, policy etc)
Regional	Pacific Maritime Safety Programme	NZ Aid/ MFAT and Maritime NZ	Kiribati, Niue, Tuvalu, Cook Islands, Samoa, and Tonga.	2011	ongoing	Current	20	~20m	Institutional development
	Strengthening Domestic Transport Connectivity in the Pacific	ADB	Kiribati Solomon Islands Tonga Vanuatu	2017	2022	Current	4.5	4.5m TA (only a portion on maritime)	Master planning
	Strengthening Domestic Transport Connectivity in the Pacific (51065-001)	ADB	Kiribati, Solomon Islands, Tonga, Vanuatu	2017	2022	Current	5.5	5m ADB, .5m Republic of Korea	Project preparation for various infrastructure projects
	Pacific Maritime Training Services program	Australia	Australia	2021	2026	Current	26	~26m (AUD36m)	Training
Cook Islands	Rehabilitation and reconstruction of Island Harbour	New Zealand		2010	2013	Completed	4.6	4.6m grant	Infrastructure construction
Federated States of Micronesia	Project for Enhancing the Capacities of Fisheries and Maritime Institute	Japan	Pohnpei with sub-regional focus including FSM, RMI and Palau.	2021		Current	3.7	3.7m	Infrastructure construction; equipment purchase
	Economic and Social Development Programme	Japan	Nation-wide	2019			4.5	4.5m grant (some portion only for ports)	Equipment purchase
	Improvement of Domestic Shipping Services	JICA	Kosrae, Pohnpei,	2013	2015	Completed	7.2	7.2m grant	Vessel purchase

	Inter-island passenger and cargo vessel	Japan	Chuuk, and Yap	2015		Completed	11.1	11.1m grant	Vessel purchase
	Federated States of Micronesia Maritime Investment Project	World Bank	Kosrae, Pohnpei, Chuuk, and Yap ports	2019	2024	Current	38.5	38.5m grant	Infrastructure planning, design, construction, and rehabilitation Institutional development/ capacity building
	Construction of Jetties	China	one in south-east, and one in north-east parts of Fiji	2019		Current	14	14m grant	Infrastructure construction
Fiji	Transport Infrastructure Investment Sector Project (formerly Bridge Replacement Project)	ADB (+WB)		2014	2022	Current	150	150m (100m ADB loan, 50m WB loan) 700k for TA	Infrastructure construction
	Transport Infrastructure Investment Sector Project and Associated TA for Strengthening Transport Coordination Capacity	ADB	Fiji	2014	2022	Current	150	150m (100m loan ADB, 50m loan WB (IBRD), 700k TA)	Infrastructure construction & rehabilitation; institutional strengthening
	Fiji Transport Infrastructure Investment Project	World Bank	Nation-wide	2015	2023	Current	167.5	167.5m (110.7m ADB loan, 50m IBRD loan, 16.8m Fiji)	Infrastructure construction
Kiribati	Various outer islands vessels and associated assets	Taiwan	Abaiaing, Aranuka	2010	2019	Completed	6	~6m grant	Vessels, sheds, equipment purchase
	Marine Training Centre - Infrastructure Development	New Zealand	Tarawa	2010	2016	Completed	8	~8m	Infrastructure construction
	Marine Training Centre - Institutional Strengthening	New Zealand	Tarawa	2009	2016	Completed	4.6	4.6m	Training and institutional strengthening

	Kiribati Outer Islands Transport Infrastructure Investment Project	World Bank	Abaiang, Beru, Nonouti, and Tabiteuea South	2020	2026	Current	42	42m grant (30m IDA World Bank, 12m ADB)	Infrastructure construction; institutional strengthening
Marshall Islands	Transitioning to Low Carbon Sea Transport (TLCSeaT)	GIZ	Majuro	2017	2022	Current	10	~10m grant German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) (IKI Fund)	Studies and analysis; vessel design and build; policy support
	Improvement of Domestic Shipping Services	JICA	Nation-wide	2012	2014	Completed	13.6	13.6m grant	Purchase of two vessels - a landing craft and a passenger-cargo vessel
	Marshall Islands Maritime Investment Project	World Bank	Majuro and outer islands	2019	2024	Current	33	33m grant	Infrastructure construction; equipment purchase; institutional development/ capacity-building
Samoa	Interisland Ferry (passenger-cargo)	JICA	Nation-wide	2019	2022	Current	23	23m grant	Vessel purchase
	The Project for Apia Fisheries Wharf	JICA	Apia	2005	2006	completed	6.4	6.4m grant	Renovation and Extension of Apia Fisheries Wharf and Related Facilities
Solomon Islands	The Project for the Construction of Market and Jetty in Auki	JICA	Auki	2009	2010	Completed	4.5	4.5m grant (some portion only jetty)	Infrastructure construction
	Domestic Maritime Support Project	ADB	Nation-wide	2008	2020	Completed	25	27m (15m grant ADB, 4.3m Australia, 5.3m New Zealand, 2.15 GoSI)	Infrastructure construction; institutional development; innovative policy and financing
	Solomon Islands Land and Maritime Connectivity Project	ADB	Nation-wide	2021	ongoing	Current	171	171m (74.5m grant, 74.4m loan, 21.8 m Solomon Islands Government)	Infrastructure construction

Tonga	Interim Ferry	Australia & NZ	Tonga	2010	2010	Completed	3.6	3.6m (1.8m Australia, 1.8m NZ)	Vessel lease
	Transport Sector Consolidation Project	World Bank	Nation-wide	2008	2018	Completed	17.09	17.09m (5.44 IDA grant, 2.33 Tonga, 10.3 Australia via Pacific Regional Initiative Fund grant) - this is total project which also covered roads and aviation - only part went to maritime ports	Infrastructure construction; equipment purchase; institutional development/ capacity-building
	The Project for Upgrading of Wharf for Domestic Transport	JICA	Nuku'alofa, Fuaa Wharf	2015	2019	Completed	29	29m grant	Infrastructure construction
	Climate Resilient Transport Project	World Bank	'Eua, Niuatoputapu	2018	2024	Current	30	~30m grant + 1.2m Tonga (covering roads, maritime, aviation and capacity building) 2.4m for strengthening the enabling environment	Infrastructure construction; institutional strengthening
Tuvalu	New ferry	Japan/JICA	Tonga	2009	2010	Completed	39	39m grant	Vessel purchase
	The Project for the Construction of the Multi-Purpose Vessel for Outer Islands Development	JICA	Nation-wide	2018	2021	Completed	4	~4m grant (463m yen)	Vessel purchase
	Construction of Cargo/Passenger vessel MV Nivaga III	JICA	Nation-wide	2013	2015	Completed	14	~14m grant (1.5billion yen)	Vessel purchase
	Maritime Investment in Climate Resilient Operations	World Bank	Nanumaga harbor and Funafuti port	2018	2024	Current	22.5	22.5m	Master planning; Infrastructure construction; Institutional strengthening; Contingency emergency response (as part of funding)

	Strengthening Domestic Shipping Project	ADB	Nation-wide	2021		Proposed	25	25m grant	Vessel purchase; operational improvements
	Outer Island Maritime Infrastructure Project	ADB	Nanumanga Island, Niutao, Nukulaelae	2015	2022	Current	48.5	48.5m grant	Infrastructure construction
	Ship to Shore Transport Project	New Zealand	Nation-wide	2008	2016	Completed	6.5	6.5m grant	Infrastructure construction; equipment purchase
Vanuatu	Interisland Shipping Support Project	New Zealand, ADB	Lenakel, Litzlitz, Luganville, Port Sandwich, Port Vila	2012	2024	Completed	51	51m (17.25m grant New Zealand, 29.3m loan ADB, 5m Gov)	Infrastructure construction; institutional development; shipping support and coordination scheme
	Lapetasi International Multi-Purpose Wharf	JICA	Lapetasi Port Vila	2012	2018	Completed	83.0	83m ODA loan JICA JPY 4.6 billion loan on 23rd May 2015, supplements the original loan of JPY 4.95 billion	Demolition and removal of the existing Lapetasi wharf and reconstruction new wharf and terminal
	Luganville Wharf Redevelopment	China	Espiritu Santo	2013	2017	Completed	93.4	80m concessional loan	Infrastructure construction
Nauru	Port institutional reform	Australia	National	2018	2019	Completed	3.3	3.3m grant	Port Institutional Reform selection of new Ports CEO undertaken
Marshall Islands, Fiji, Kiribati	Cerulean	USP, Swire Shipping	To service outer islands between Fiji and Marshall Islands	2019		Current	4	~4m funded by Swire Shipping	Vessel design and build
Global	GHG-SMART programme	IMO, Korea	SIDs	2020	2024	Current	2.5	2.5m grant Korea	Training

Notes:

Key information sources used to compile this inventory:

- Lowy Institute Pacific Aid Map (Lowy Institute, 2021)
- Asian Development Bank project documents (Asian Development Bank, 2021)
- World Bank project documents (World Bank, 2021)
- JICA project documents (JICA, 2021).

Official information on projects funded by Australia, New Zealand, China, and the United States is difficult to access. However, there are no major ports-related projects by these partners that the study team is aware of in the countries surveyed, other than those included here.

Other information was taken from country government websites or news media – details are included in the accompanying inventory database.

6 IDENTIFYING OPPORTUNITIES FOR STRENGTHENING REGIONAL COOPERATION

6.1 General

In general, there is a great deal of need for support for sustainable ports and maritime connectivity in PICs. This section outlines some general considerations to be taken into account when working with PICs.

The fundamental character of the sector arising from small size and remote and dispersed geography create a unique context and set of development constraints. Bespoke solutions must be designed for the particular needs and capabilities of a country. Working within Pacific institutional environments, both national and regional, requires time and patience, and relies on good relationships. The approach used in larger, mainland countries in other regions, cannot be automatically applied in PICs.

Some stakeholders indicated that too often attention is placed on aspirational ideas that do not immediately meet the needs of PIC communities. For example, applying digitalisation to ports that handle only a few thousand TEUs per year may add an unwelcome burden, and may not improve efficiency or have an appreciable impact on the cost or frequency of services. On the other hand, supporting a country with urgent repairs, basic maintenance, and budgeting for maintenance and refurbishment may have a very significant impact on the reliability and efficiency of the supply chain.

Development partner congestion requires improved coordination. As discussed in section 3.6.1, PICs are experiencing increased attention from development partners and increased levels of investment that challenge their absorptive capacity to fully utilise this support. Fragmentation – where aid comes in ‘too many slices from too many donors’ – creates high transaction costs and makes it difficult for PICs to manage their development (Dornan & Pryke, 2017). Aspects of absorptive capacity that partners can support is to improve donor coordination, reduce the number of interfaces countries have with different donors, and support the development of country-driven sector strategies.

6.2 Existing processes for identifying initiatives and programs

There are several existing mechanisms in the Pacific region for the identification of activities (initiatives/ projects/ programs) for maritime connectivity and ports development, including sustainability and green ports measures. The most significant processes are captured here.

Recommendation: UN ESCAP enhance the engagement with existing strategic and project pipeline development processes to identify where ESCAP’s support can contribute to specific activities.

6.2.1 World Bank region-wide strategic studies

Blue Transformation for Maritime Transport in the Pacific

The World Bank’s Blue Transformation for Maritime Transport in the Pacific Advisory Services and Analytics (ASA) is currently underway with key findings expected in the first half of 2022. The ASA comprises a comprehensive region-wide study across four key areas, aiming to identify specific opportunities to support maritime connectivity, green ports, and institutional and policy development.

The ASA has five key components as follows:

- i) The **Connectivity Assessment** is mapping regional and country-specific services and the actual and future needs for movement of freight and passengers of each country, identifying gaps and deficiencies, and recommending options for the development of an integrated and efficient connectivity plan.
- ii) The **Vulnerability Assessment** is assessing the vulnerability of the regional maritime transport system to natural disasters and climate change – including coastal infrastructure, shipping fleets and logistics services. It will be proposing options for improved risk preparedness and response that may include climate resilient infrastructure, and spatial and sectoral planning, taking into account the existing efforts by PICs and development partners.

- iii) The **Strategic Needs Assessment** is reviewing the blue economy aspirations of each of 12 PICs across tourism, passenger transport, fisheries, and domestic and international trade, carrying out a detailed gap analysis of the required maritime, port and supply chain infrastructure in each country for both domestic and international connectivity, looking out to 2040. It will identify specific short-, medium- and long-term measures, and propose a costed implementation plan. This assessment complements the Connectivity Assessment with a focus on the infrastructure requirements.
- iv) The **Green Ports Assessment** is assessing the environmental sustainability of 15 Pacific Ports in the PICs in terms of infrastructure and operations, benchmarking the ports against international peers, and developing specific recommendations and a roadmap for enhancing the ports' environmental sustainability in the Pacific context.
- v) The **Institutional Assessment** is mapping country-level institutional arrangements, resources, and legislation, international and regional organisations related to the maritime sector in areas of maritime transport, maritime safety and security, resilience, and green ports/shipping/logistics. The assessment will make recommendations for key institutional enhancement through organisational and structural changes, resources and funding, private sector participation, and training.

Building on the region-wide review for these assessments, a detailed needs assessment and country-specific diagnosis will be undertaken for three countries – Fiji, Solomon Islands and Tonga. (World Bank, 2021)

Strengthening of the Pacific Blue Shipping Partnership (PBSP)

In addition to the Blue Transformation for Maritime Transport in the Pacific ASA, the World Bank has been asked to support the development of the **Pacific Blue Shipping Partnership (PBSP)** – a country-driven initiative led by Fiji and the Marshall Islands, with several PIC member countries. The PBSP seeks large-scale investment of USD500m into regional low-carbon shipping to achieve the goal of 40% reduction of GHG emissions by 2040 and totally decarbonised shipping sector by 2050 in member countries. This phase of the work will include:

- a. a **baseline assessment of the maritime sector in each member country**, with a focus on the domestic commercial shipping fleet and infrastructure, including fuel use and GHG emissions.
- b. a **Zero-Carbon Transition Plan** that includes a number of possible decarbonisation pathways for the maritime transport sector, specific zero-/low-carbon technologies that may be used, and recommended transition pathways that align with the needs of PBSP member countries.
- c. a **Blended Finance Roadmap** that includes a 10-year USD500 million program of investments, the concept for a financing facility, and the long-term technical and capacity needs for implementation. (World Bank, 2021)

As can be seen from these descriptions, this World Bank work is likely to provide comprehensive and strategic identification of priorities for the region in the form of advisory and capacity support by drafting a governance framework that will support the enhancement and implementation of a multi-country maritime NDC and the strengthen the PBSP itself.

6.2.2 Pacific Region Infrastructure Facility (PRIF) Transport WG

The Pacific Region Infrastructure Facility (PRIF) currently convenes a Transport Working Group for development partners to coordinate and share information across the transport sector. While this works quite well, the large number of people and the broad scope tends to keep discussion at a relatively high level. There may be potential for a development partner forum focused on maritime connectivity.

6.2.3 The Pacific Community (SPC) meetings of transport ministers and officials

SPC convenes key processes for identifying needs and programming responses at both country level and regional level for ports and maritime connectivity related issues. These processes are based on two-yearly conferences of Ministers and officials from around the region, where regional priorities for energy and transport, and SPC's role in that, are discussed and decided. The Minister's meeting is supported by regular meetings of transport officials, including heads of maritime organisations. Through these processes, countries share updates on their national priorities, and develop consensus around regional priorities.

6.2.4 National Infrastructure Investment Plans (NIIP)

Various national level sustainable development strategies, sector strategies and infrastructure plans exist in PICs. Probably the most relevant are the National Infrastructure Investment Plans (NIIP) that identify priorities across multiple sectors. These have been largely supported by PRIF and identify a list of priority infrastructure investments across all sectors. Available NIIPs include (PRIF, 2021):

- Cook Islands NIIP 2015 & NIIP 2020
- Nauru Economic Infrastructure Strategy and Investment Plan 2011 & 2019
- Niue Transport Strategy and Short-term Action Plan 2017-2026
- Palau NIIP 2021-2030
- Samoa National Infrastructure Strategic Plan 2011
- Solomon Islands NIIP 2013-2023
- Tonga NIIP 2010 & NIIP 2013-2023
- Tuvalu Infrastructure Strategy and Investment Plan 2016-2025 & Priority Infrastructure Investment Plan 2020-2025
- Vanuatu - Vanuatu 2030 The Peoples Plan - National Sustainable Development Plan (NSDP)/Vanuatu Infrastructure Strategic Investment Plan (VISIP) 2015-2024.
- Federated States of Micronesia – Strategic Development Plan 2004 -2023.
- Marshall Islands - s The National Strategic Plan (NSP) 2020–2030
- Fiji - National Development Plan (NDP) 2017 (5- & 20-year plan)
- Kiribati - Kiribati Development Plan (KDP) 2016-19

6.3 Potential specific opportunities for regional cooperation with the support of UNESCAP

The ESCAP secretariat's activities include generating action-oriented knowledge and providing technical assistance and capacity-building services. Resolution 76/1 (ESCAP, 2020) requests the ESCAP Executive Secretary to:

- strengthen and develop partnerships for the conservation and sustainable use of the oceans, seas, and marine resources, including through participatory, multi-stakeholder dialogue platforms
- strengthen and facilitate national capacities for the effective implementation of relevant internationally agreed conventions to conserve and sustainably use the oceans, seas, and marine resources, in collaboration with relevant United Nations bodies and specialized agencies and regional and subregional organizations, in line with their existing mandates
- support small island developing States in sharing experiences and enhancing cooperation on the conservation and sustainable use of marine resources
- continue to support systematic regional dialogue on sustainable maritime connectivity, in close collaboration with the key global and regional stakeholders.

In line with this role for ESCAP, the following areas and opportunities might be worthy of consideration for country specific and regional level support by ESCAP:

- Support the existing regional processes for identification of needs including the World Bank strategy studies, the PRIF coordination processes, and SPC's work with countries to identify regional priorities, including by providing forums for sharing the insights and priorities emerging from these studies.

- Support for regional professional associations to provide networking, knowledge sharing and have ready access to experts in particular areas including maritime law, corporate governance, enabling private sector participation, etc.
- Brokering of partnerships and resources for learning exchanges and study tours for staff of ports and government agencies with peer ports in the Asia-Pacific region.
- Technical assistance for: port pricing formula methodology and forecasting trade growth models. Support for a study on freight and port charges, to inform countries on regional comparisons of pricing using a standard unit scale. This would allow an examination of potential adjustments that could be made on to align port pricing without fear of over-inflating tariff levels. Similarly regional comparisons by commodity of import and export freight rates charged by shipping lines would provide clarity on pricing policies of shipping lines. It may also allow a regional Pacific body to lobby on behalf of partner countries where monopolistic pricing might be evident.
- Support for implementation of international agreements including green port developments that involve ISO accreditation and standards for monitoring and evaluation. Support could extend to creation of a regional Pacific Green port recognition levels where countries agree scales of development building to a total accreditation that conforms to the international ISO standards.
- Development of national legislation and compliance arrangements to implement international conventions. This could include development of model legislation and regulations for the region and brokering access to maritime law experts. This would be done in partnership with the IMO and SPC.
- Governance and institutional development, enabling PPP's and scaled private sector involvement. Support for enabling PICs to review the levels of private sector investment in supply of port and maritime services. This would include elaborating the benefits of PPP's and private sector contracts that would remove recurrent operational and capital expenditure and lower operating risks from the state owned port authorities and state owned shipping (ferry) service providers.
- Asset management planning including preventative maintenance and renewals budgeting processes, and asset management plans. This technical assistance could be introduced as a regional campaign using a standard approach and standard costs. This would also allow potential cross training between different ports that have similar port installations and marine constructions.
- Support for PacWIMA training, exchanges, and mentoring to build women's leadership in the maritime sector and contribute to more adaptable maritime organisations in the Pacific.

7 BIBLIOGRAPHY

- ABC News. (2010, April 30). *Tongan Attorney-General resigns amid corruption scandal*. Retrieved from ABC News Radio (ABC news): <https://www.abc.net.au/pm/content/2010/s2886887.htm>
- ABC Radio. (2019, March 4). *Clarity sought on investigation into PNG's Rabaul Queen ferry disaster*. Retrieved from ABC Radio Australia: <https://www.abc.net.au/radio-australia/programs/pacificbeat/rabaul-victims/10866474>
- ADB. (2007). *Oceanic Voyages*. Manila: Asian Development Bank - Pacific Studies Series.
- ADB. (2010). *Vanuatu Inter-Island Shipping Support Project*. Manila: Asian Development Bank (ADB).
- ADB. (2015). *Nauru Port Pre-feasibility Study*. Manila: ADB.
- ADB. (2017). *CASE STUDIES IN PRIVATE SECTOR PARTICIPATION FRANCHISE SHIPPING*. Retrieved from Pacific Private Sector Development Initiative: <https://www.adb.org/sites/default/files/publication/230276/pacific-franchise-shipping.pdf>
- ADB. (2017). *Ports Development Master Plan in Fiji*. Manila: Asian Development Bank (ADB).
- ADB. (2018). *Pacific Transport Update 2018*. Manila: Asian Development Bank.
- ADB. (2019). *Trade and Transport Facilitation in the Pacific*. Manila: Asian Development Bank (ADB).
- ADB. (2020). *Trade and Maritime Transport Trends in the Pacific (RETA 8674)*. Manila: Asian Development Bank.
- ADB. (2020). *Asian Development Bank, 'Tourism-Driven Economies in the Pacific to Feel Brunt of COVID-19 Pandemic', 3 April 2020*. Manila: Asian Development Bank.
- ADB. (2020). *Safeguards Due Diligence Report Nuku'alofa Port Upgrade Project*. Manila: ADB.
- ADB. (2021). *ADB Pacific Approach 2021-2025*. Manila: Asian Development Bank.
- AIFFP. (2021, June 25). *Australia and Papua New Guinea signed an MOU to support PNG maritime port infrastructure through the AIFFP*. Retrieved December 2021, from Australian Infrastructure Financing Facility: <https://www.aifffp.gov.au/news/australia-and-papua-new-guinea-signed-mou-support-png-maritime-port-infrastructure-through-aifffp>
- Alejandrino-Yap, M. C., Dornan, M., & McGovern, K. (2013). *INFRASTRUCTURE MAINTENANCE IN THE PACIFIC: Challenging the Build-Neglect-Rebuild Paradigm*. Sydney: Pacific Infrastructure Advisory Centre.
- Alpha Liner. (2021, December 1). *Shipping intelligence Database*. Retrieved from Alpha Liner : <https://public.axsmarine.com/alphaliner>
- AMSTEC Pty Ltd. (2016). *Samoa Ports masterplan*. Sydney: AMSTEC Pty Ltd.
- An, S. (2021). *Port Development for Maritime Connectivity Enhancement in PIC's*. Seoul: Korea Maritime Institute (KMI) - Presentation .
- Anderson, J. (2001). *Trade and informal institutions*. Mimeo.
- Anderson, J., & Marcouiller, D. (2001). *Trade and security*. NBER working paper No. 6223.
- Arslanalp, S., Koepke, R., & Verschuor, J. (2021). *Tracking Trade from Space: An Application to Pacific Island Countries*. Washington, D.C.: IMF, Asia and Pacific Department and Statistics Department Article in IMF Working Papers · August 2021.
- Asia Today News. (2017, October 4). *ANL acquires SOFRANA Unilines, adds Townsville link to SE Asia*. Retrieved from Asia Today News: <https://asiatoday.com.au/content/anl-acquires-sofrana-unilines-adds-townsville-link-se-asia>
- Asian Development Bank. (2021, December). *Projects & Tenders*. Retrieved December 2021, from Asian Development Bank: <https://www.adb.org/projects>
- ASL. (2021, December 1). *BURNS PHILP & Co Ltd*. Retrieved from AUSTRALIAN SHIPPING LINES (ASL): <https://www.flotilla-australia.com/burnsphillp.htm>

- Baker, N., & Campbell, A. (2021). *Navigating Islands Futures in Transport*. New Zealand Ministry of Foreign Affairs and Trade, Wellington, New Zealand.
- BDG Science Media. (2021, December 1). *5,000 YEARS AGO, A GROUP OF PEOPLE LEFT TAIWAN AND CHANGED THE WORLD*. Retrieved from INVERSE © 2021 BDG Media,: <https://www.inverse.com/culture/pacific-islands-worldview>
- Burkhardt, M. (2020). *Impacts of natural disasters on supply chain performance*. Karlsruhe: Karlsruher Institut für Technologie.
- Clark, R. (2021, September 6). *20th Micronesia Presidents' Summit Succeeds at Strengthening Solidarity, Concretizing Subregional Initiatives*. Retrieved from The National Government of the Federated States of Micronesia: <https://gov.fm/index.php/component/content/article/35-pio-articles/news-and-updates/522-20th-micronesia-presidents-summit-succeeds-at-strengthening-solidarity-concretizing-subregional-initiatives?Itemid=177>
- Corrin, J. (2019, June). Grounding of the Solomon Trader. *Twilight Panel*, <https://law.uq.edu.au/files/47360/UQSIP-MASLU-Solomon-Trader-FINAL.pdf>. Brisbane: University of Queensland.
- DA-ADB. (2017, August 7). *What We Can Learn from Franchise Shipping Schemes in the Pacific*. Retrieved from Asian Development Bank - Development Asia: <https://development.asia/policy-brief/what-we-can-learn-franchise-shipping-schemes-pacific>
- Daily Post News. (2019, June 15). *NZ Foreign Minister briefed on status of South Paray domestic wharf project*. Retrieved from Daily Post News Vanuatu: https://www.dailypost.vu/news/nz-foreign-minister-briefed-on-status-of-south-paray-domestic-wharf-project/article_47512cc6-d7f5-59ea-9dda-7ff5b3b204f2.html
- Davila, F., Bourke, R., McWilliam, A., Crimp, S., Robins, L., van Wensveen, M., . . . Butler, J. (2021). COVID-19 and food systems in Pacific Island Countries, Papua New Guinea, and Timor-Leste. *Opportunities for actions towards the sustainable development goals, Agricultural Systems*, .
- de Sitter, W. R. (1984). Costs of service life optimization "The Law of Fives". *CEB-RILEM Workshop on Durability of Concrete Structures (Copenhagen, Denmark, May 18-20, 1983)*. *CEB Bulletin d'Information*; Vol. 152, pp. <https://research.tue.nl/en/publications/costs-of-service-life-optimization-the-law-of-fives>. Comité Euro-International du Béton.
- DITRC. (2021, April 29). *Tasmanian Freight Equalisation Scheme TFES* . Retrieved from The Department of Infrastructure, Transport, Regional Development and Communications (DITRC): <https://www.bitre.gov.au/publications/2021/monitoring-report-2020-tasmanian-freight-equalisation-scheme>
- DLA piper. (2017, September 13). *DLA Piper launches latest Pro Bono partnership with The University of the South Pacific*. Retrieved from DLA Piper: <https://www.dlapiper.com/en/australia/news/2017/09/dla-piper-launches-latest-pro-bono-partnership/>
- DLA Piper. (2019, February 26). *DLA Piper strengthens the future of Law in the Pacific*. Retrieved from DLA Piper: <https://www.dlapiper.com/en/newzealand/news/2019/03/dla-piper-strengthens-the-future-of-law-in-the-pacific/>
- Dollar, D., & Kraay, A. (2003). Institutions, trade and growth. *Journal of Monetary Economics*, Vol. 50, No. 1, 133-62.
- Dornan, M., & Pryke, J. (2017). Foreign aid to the Pacific: Trends and development in the twenty-first century. *Asia & the Pacific Policy Studies*, https://www.researchgate.net/publication/318544260_Foreign_Aid_to_the_Pacific_Trends_and_Developments_in_the_Twenty-First_Century_Foreign_Aid_to_the_Pacific.
- Ducruet, C., & Notteboom, T. (2012). Developing Liner Service Networks in Container Shipping. *A complete guide to effective shipping and port management*, Kogan Page, London, ISBN 978 0 7494 6369 4, p. 77-100 , Kogan Page, London, p. 77-100 .

- EB. (2021, December 1). *Early European settlement*. Retrieved from Encyclopaedia: <https://www.britannica.com/place/Pacific-Islands/Early-European-settlement>
- Elnaz, I. (2020). *The Architectural Design Requirements of a Blockchain-Based Port Community System*. Brisbane: MDPI - The Australian Road Research Board.
- ESCAP. (2020). 76/1. Strengthening cooperation to promote the conservation and sustainable use of the oceans, seas and marine resources for sustainable development in Asia and the Pacific. *Resolution adopted by the Economic and Social Commission for Asia and the Pacific* (pp. https://www.unescap.org/sites/default/d8files/event-documents/RES_76_1_ENG.pdf). United Nations.
- FFA . (2020). *Economic and Development Indicators and Statistics: Tuna Fisheries of the Western and Central Pacific Ocean*. Honiara: Forum Fisheries Agency, Honiara, Solomon Islands.
- Fox, L. (2020, November 26). Solomon Islands oil spill report leaked to ABC reveals economic losses of up to \$50 million. *Australian Broadcasting Corporation News*, pp. <https://www.abc.net.au/news/2020-11-26/solomon-islands-leaked-report-on-oil-spill-damage/12923050>.
- FPCL. (2020). *Fiji Ports Corporation Ltd*. Suva: FPCL.
- Gani, A., & Prasad, B. (2006). *Institutional Quality and Trade in Pacific Island Countries*. Asia-Pacific Research and Training Network.
- Gillett, R. (2005). Pacific Island Countries Region In Review of the State of World Marine Resources. *Fisheries Technical Paper 457*, Rome. FAO. Pp144—157.
- Graue, C. (2019, July 3). Is Australia's labour scheme creating a 'brain drain' in the Pacific? *Australian Broadcasting Corporation: Pacific Beat*, pp. <https://www.abc.net.au/radio-australia/programs/pacificbeat/aus-labour-scheme-and-pacific-brain-drain/11273406>.
- Halter, N. (2021). *Australian Travellers in the South Seas*. Canberra: Australian National University 1st ed., ANU Press, 2021. Retrieved from <https://doi.org/10.2307/j.ctv1h45mfk>.
- Hezel, F. (2013). *Showing Respect - The Logic of Pacific Island Culture*. Hawaii: University of Hawaii Press.
- Huffer, E., & Molisa, G. (1999). Governance in Vanuatu. Pacific Economic Pacific Economic. *Pacific Economic Journal - ANU*, 101-111.
- Huynh, N. (2008). Analysis of container dwell time on marine terminal throughput and rehandling productivity. *Journal of International Logistics and Trade Jungseok Research Institute of International Logistics and Trade, Inha University*, .
- IFC. (2014). *Assessment of the Economic Impact of Cruise Ships to Vanuatu*. Washington D.C: The World Bank Group - International Finance Corporation .
- IMF. (2020, April). *PACIFIC ISLANDS MONITOR*. Retrieved from International Monetary Fund (IMF): <https://www.imf.org/-/media/Files/Countries/ResRep/pis-region/small-states-monitor/042120.ashx>
- IMO. (2021, December 1). *International treaties can only become law when implemented into into national legislation*. Retrieved from International Maritime Organization (IMO).: <https://www.imo.org/en/MediaCentre/PressBriefings/Pages/24-legal-workshop.aspx>
- IMO. (2021, October 26). *ratification and effective implementation of conventions relating to oil pollution preparedness, response and co-operation (OPRC)*. Retrieved from International Maritime Organization (IMO).: <https://www.imo.org/en/MediaCentre/Pages/WhatsNew-1647.aspx>
- International Maritime Organization (IMO). (2021). *Next Gen – Projects*. Retrieved from Next Gen – Towards Green and Efficient Navigation: <https://nextgen.imo.org/projects>
- James, D. (2021, April 19). *Papua New Guinea's Lae set to become Pacific hub*. Retrieved from PNG Business Advantage: <https://www.businessadvantagepng.com/papua-new-guineas-lae-set-to-become-pacific-hub/>
- JICA. (2013). *Data Collection Survey on Reverse Logistics in the Pacific Islands*. Tokyo: Japan International Cooperation Agency (JICA).

- JICA. (2013). *PREPARATORY SURVEY REPORT THE PROJECT FOR IMPROVEMENT DOMESTIC SHIPPING SERVICES THE FEDERATED STATES OF MICRONESIA*. Tokyo: JAPAN INTERNATIONAL COOPERATION AGENCY (JICA).
- JICA. (2015). *Preparatory Report Enhancement of Safety of Apia Port Samoa*. Tokyo: Japan International Cooperation Agency (JICA).
- JICA. (2018). *The Project for Construction of a Cargo/Passenger Vessel for Tuvalu*. Tokyo: Japan Economic Research Institute Inc.
- JICA. (2019, December). *Message from the Resident Representative - Lapatasi Multi-purpose wharf Port Vila*. Retrieved from Japan International Cooperation Agency (JICA) : <https://www.jica.go.jp/vanuatu/english/office/about/message.html>
- JICA. (2021, December). *Technical Cooperation Projects*. Retrieved December 2021, from Japan International Cooperation Agency: <https://www.jica.go.jp/project/english/index.html>
- JOC. (2014). *Berth Productivity - The Trends, Outlook and Market Forces Impacting Ship Turnaround Times*. Newark, New Jersey: JOC Group Inc.
- Johnson, G. (2021, November 26). Marshall Islands census numbers show heavy out-migration. *Radio New Zealand*, pp. <https://www.rnz.co.nz/international/pacific-news/456630/marshall-islands-census-numbers-show-heavy-out-migration>.
- Kavirathna, C., Kawasaki, T., Hanaoka, S., & Matsuda, T. (2018). Transshipment hub port selection criteria by shipping lines: the case of hub ports around the bay of Bengal. *Journal of Shipping and Trade - Springer Link*.
- Kim, Y., & Ross, L. (2019). *Ports: An industry guide to enhancing resilience. Resilience Primer*. Four Twenty Seven Inc. and Resilience Shift, UK.
- Law and Justice Foundation. (2021, December 1). *Law and Justice Foundation of NSW*. Retrieved from Law and Justice Foundation of NSW: <http://www.lawfoundation.net.au/>
- Legislative Assembly of Tonga. (2010). *The Royal Commission of Inquiry into the Sinking of the MV Princess Ashika Final Preliminary Report*. Nuku'alofa: Legislative Assembly of Tonga.
- LIM, S.-M. (2011). Economies of scale in container shipping. *Maritime Policy & Management: The flagship journal of international shipping and port research.*, 25. 361-373.
- Lima, A., & Venables, J. (2001). *Lima, A and Venables, J. 2001: Infrastructure, geographical disadvantage and transport costs. World*. Washington: World Bank Economic Review No. 15.
- Lloyd's List. (2021). *Lloyd's List One Hundred Ports 2021*. London: Informa UK Ltd 2021.
- Lowy Institute. (2021, September). Retrieved December 2021, from Pacific Aid Map: <https://pacificaidmap.lowyinstitute.org/>
- Magala, M., & Sammons, A. (2008). A New Approach to Port Choice Modelling. *Maritime Economics & Logistics*, 9 - 34. Retrieved from A New Approach to Port Choice Modelling
- Marine Traffic. (2019, December 1). *Marine Traffic - container shipping density map*. Retrieved from Marine Traffic: <https://www.marinetraffic.com/en/ais/home/centerx:141.6/centery:-38.4/zoom:11>
- Matatia, N. (2018, June 27). *Improved Apia Port opens*. Retrieved from Samoa Observer News: <https://www.samoaoobserver.ws/category/samoa/16187>
- Matson Line. (2021, December 1). *Innovation in the Pacific*. Retrieved from Matson Line: https://www.matson.com/corporate/about_us/history.html
- McGregor, A., Bourke, R., & Sakiusa, R. (2009). Pacific Island food security. *Situation, challenges and opportunities*, 24. 24-42.
- McKinsey & Company. (2017). *Container shipping: The next 50 years Steve Saxon & Matt Stone*. New York, NY: McKinsey & Company Inc.

- McMahon, C. (2021). *Pacific Infrastructure Performance Indicators 2021*. Pacific Region Infrastructure Facility (PRIF) and Pacific Community (SPC). Sydney: Pacific Region Infrastructure Facility (PRIF).
- McSweeney, R. (2018, April 25). *Low-lying atolls could become 'uninhabitable' earlier than thought*. Retrieved from Carbon Briefing: <https://www.carbonbrief.org/low-lying-atolls-could-become-uninhabitable-earlier-than-thought>
- Mellor, T., & Jabes, J. (2004). Manila: GOVERNANCE IN THE PACIFIC: FOCUS FOR ACTION- Asian Development Bank.
- Mellor, T., & Jabes, J. (2004). Manila: Governance in the Pacific: Focus for action, Asian Development Bank (ADB).
- MoC Fiji Govt. (2015, November 5). *GOVERNMENT TO DIVEST SHARES IN FIJI PORTS CORPORATION LTD.* Retrieved from Ministry of Communications Fiji Government (MoC): <https://www.fiji.gov.fj/Media-Centre/News/GOVERNMENT-TO-DIVEST-SHARES-IN-FIJI-PORTS-CORPORAT>
- MoC Fiji Govt. (2013, April 30). *Fiji Ports Corporation Limited with AITKEN SPENCE PCL - PM Bainimarama*. Retrieved from Ministry of Communications Fiji Government: <https://www.fiji.gov.fj/Media-Centre/Speeches/English/Fiji-Ports-Corporation-Limited-with-AITKEN-SPENCE>
- National Geographic Society. (2021, December 1). *RESOURCE LIBRARY | ENCYCLOPEDIC ENTRY*. Retrieved from RESOURCE LIBRARY | ENCYCLOPEDIC ENTRY: <https://www.nationalgeographic.org/encyclopedia/atoll/>
- Nauru Govt. (2020, August 26). *Nauru Shipping Line Launched*. Retrieved from Nauru government bulletin: http://naurugov.nr/media/133046/nauru_bulletin__15_26aug2020__219_.pdf
- Neptune Pacific Line. (n.d.). Retrieved December 2021, from Pacific Forum Line: <https://www.pacificforumline.com/>
- NETPAS. (2021, December 1). NETPAS VOYAGE DISTANCE ESTIMATOR. NETPAS SEAFUTURES INC .
- Netpas Distance. (2021, december 1). *Netpas Distance naviagtion* . Retrieved from Netpas Distance naviagtion: <https://www.netpas.net/>
- Notteboom, T. (2016). The adaptive capacity of container ports in an era of mega vessels The case of upstream seaports Antwerp and Hamburg. *Journal of Transport Geography*, Vol. 54, 295-309.
- Notteboom, T., Pallis, A., & Rodrigue, J. (2022 release date). New York: Port Economics, Management and Policy - Routledge.
- NPDL. (2021, December 1). *NPDL Fiji Transshipment Shipping Networks* . Retrieved from NPDL Shipping Schedules: <https://www.npdlship.com/services/service-routes/fiji-and-pacific-services/>
- NPDL. (2021, December 1). *Sailing Schedules - Neptune Pacific Direct Line (NPDL)*. Retrieved from Neptune Pacific Direct Line (NPDL): <https://www.npdlship.com/schedules/>
- NZ Herald. (2010, April 30). *Tongan official quits over 'interference'*. Retrieved from NZ Herald newspaper online : <https://www.nzherald.co.nz/world/tongan-official-quits-over-interference/GP5MOEH63NCXIUD2HTBQ5PEIW4/>
- NZ MFAT. (2021, December 1). *MFAT Monitoring Global Supply Chains — May–June 2021*. Retrieved from NZ MFAT: <https://www.mfat.govt.nz/en/trade/mfat-market-reports/market-reports-global/mfat-monitoring-global-supply-chains-mayjune-2021/>
- OECD Development Assistance Committee (DAC). (2021). *Net official development assistance received (constant 2018 US\$) - Pacific island small states*. Retrieved December 2021, from The World Bank: Data: <https://data.worldbank.org/indicator/DT.ODA.ODAT.KD?end=2019&locations=S2&start=1999>
- Osifelo, E., & Martin, L. (2019, March 6). 'We cannot swim, we cannot eat': Solomon Islands struggle with nation's worst oil spill. *The Guardian*, pp. <https://www.theguardian.com/environment/2019/mar/06/solomon-islanders-suffer-worst-oil-spill-nations-history-bulk-carrier-bauxite>.

- Pacific Community (SPC). (n.d.). *About the MTCC-Pacific Project*. Retrieved from Pacific Community (SPC): <http://mtccpacific.spc.int/about-the-project/>
- Pacific Region Infrastructure Facility. (2021). *Pacific Region Infrastructure Facility*. Retrieved December 2021, from <https://www.theprif.org/>
- PacWIMA. (2021). Retrieved December 2021, from Pacific Women in Maritime Association: <https://pacwima.com/about/>
- Parliament of Samoa. (2014). *Annual report 2012-13 Samoa Ports Authority*. Retrieved from Samoa Ports Authority (SPA): <https://www.palemene.ws/wp-content/uploads/05.Annual%20Reports/SPA/SPA-Annual-Report-2012-2013.pdf>
- PECC. (2016). MANAGING THE BLUE ECONOMY (SEMINAR 3): FUTURE OF PORTS AND SHIPPING IN THE ASIA-PACIFIC | AUCKLAND, NEW ZEALAND | DECEMBER 5-7, 2016. *MANAGING THE BLUE ECONOMY (SEMINAR 3): FUTURE OF PORTS AND SHIPPING IN THE ASIA-PACIFIC | AUCKLAND, NEW ZEALAND | DECEMBER 5-7, 2016* (p. Samoa Ports Authority Presentation). AUCKLAND, NEW ZEALAND: The Pacific Economic Cooperation Council. <https://www.pecc.org/resources/infrastructure-1/2394-case-study-from-apia/file>.
- PIANC. (2014). *Masterplans for the Development of Existing Ports Report n° 158*. Brussels: The World Association for Waterborne Transport Infrastructure.
- PIANC. (2020). *Climate Change Adaptation Planning for Ports and Inland Waterways*. Brussels: The World Association for Waterborne Transport Infrastructure.
- PIF. (2004). *Pacific Regional Transport Study*. Suva: Pacific Island Forum (PIF).
- PIF. (2020). *Regional E-Commerce Assessment*. Suva: Pacific Islands Forum Secretariat, 2020.
- PIFS. (n.d.). *Pacific Islands Forum Secretariat*. Retrieved December 2021, from Pacific Islands Forum: <https://www.forumsec.org/pacific-islands-forum-secretariat/>
- PNA. (2021). *Parties to the Nauru Agreement*. Retrieved from Parties to the Nauru Agreement.: <https://www.pnatuna.com/index.php/>
- Polynesian Voyaging Society. (2021, December 1). *Polynesian Voyaging Society*. Retrieved from Polynesian Voyaging Society: <http://www.hokulea.com/home/>
- Port Authority of New South Wales. (n.d.). *Green Port Guidelines*. Sydney: Port Authority of New South Wales.
- Port Security Center . (2021, December 1). *The Port Facility Security Plan*. Retrieved from Port Security Center : <https://www.portsecuritycenter.eu/>
- Ports Authority Tonga. (2011). *Pacific Maritime Transport Alliance (PMTA)*. Retrieved December 2021, from Ports Authority Tonga: http://www.portsauthoritytonga.com/index.php?option=com_content&view=article&id=166:pacific-maritime-transport-alliance-pmta&catid=109:latest-pat-news&Itemid=575
- PPIAF. (2021, December 1). *Port Reform Toolkit Second Edition*. Retrieved from Port Reform Toolkit - The Public-Private Infrastructure Advisory Facility (PPIAF): <https://ppiaf.org/sites/ppiaf.org/files/documents/toolkits/Portoolkit/Toolkit/index.html>
- PRIF. (2012). *Honiara Port Scoping Study, Solomon Islands*. Sydney: Pacific Region Infrastructure Facility (PRIF).
- PRIF. (2015). *Nauru Port Pre-Feasibility Study*. Sydney: Pacific Region Infrastructure Facility (PRIF).
- PRIF. (2021). *National Infrastructure Investment Plans*. Retrieved December 2021, from Pacific Region Infrastructure Facility: <https://www.theprif.org/national-infrastructure-investment-plans>
- PRIF. (2021). *REVIEW OF ECONOMIC INFRASTRUCTURE IN THE PACIFIC - Pacific Infrastructure Performance Indicators*. Sydney: Pacific Region Infrastructure Facility (PRIF).
- PRIF. (2021). *Review of Economic Infrastructure in the Pacific: Pacific Infrastructure Performance Indicators 2021 (PIPI's)*. Sydney: Pacific Region Infrastructure Facility (PRIF).

- Prince, A., & Mackeen, D. (2017). *Solid Waste Management and Recycling*. Sydney: Pacific Region Infrastructure Facility (PRIF).
- PSDI. (2016, June 13). *Comparative Study on Pacific Ports' Pricing and Productivity Released*. Retrieved from Private Sector Development Initiative - Asian Development Bank Pacific Liaison & Coordination Office: <https://www.pacificpsdi.org/news-and-insights/news/read/comparative-study-on-pacific-ports-pricing-and-productivity-released>
- PSDI. (2019). *PACIFIC PRIVATE SECTOR DEVELOPMENT INITIATIVE*. Sydney: ADB / PRIF.
- Reeves, J. (2018). *Niue National Transport Strategy and short term Action Plan 2017-2026*. Sydney: PRIF and Government of Niue.
- Riku, T., & Kato, H. (2021). Ports and maritime container cargo movement in the Pacific. *Global Logistics Network Modelling and Policy*.
- RNZ. (2009, September 2). *Overseas engineers arrive in Samoa to help rescue container vessel*. Retrieved from Radio New Zealand (RNZ): <https://www.rnz.co.nz/international/pacific-news/185819/overseas-engineers-arrive-in-samoa-to-help-rescue-container-vessel>
- RNZ. (2012, March 12). *Lack of funds from PNG Government jeopardising Rabaul Queen disaster inquiry*. Retrieved from Radio New Zealand (RNZ): <https://www.rnz.co.nz/international/pacific-news/203167/lack-of-funds-from-png-government-jeopardising-rabaul-queen-disaster-inquiry>
- RNZ. (2019, October 8). *Litany of failures led to Kiribati ferry tragedy - inquiry report*. Retrieved from Radio New Zealand (RNZ): <https://www.rnz.co.nz/international/pacific-news/400530/litany-of-failures-led-to-kiribati-ferry-tragedy-inquiry-report>
- RNZ. (2021, May 28). *Captains among 11 charged in relation to ferry sinking*. Retrieved from Radio NZ: <https://www.rnz.co.nz/international/pacific-news/443532/captains-among-11-charged-in-relation-to-ferry-sinking>
- RNZ. (2021, May 28). *Captains among 11 charged in relation to ferry sinking*. Retrieved from Radio NZ (RNZ): <https://www.rnz.co.nz/international/pacific-news/443532/captains-among-11-charged-in-relation-to-ferry-sinking>
- RNZ. (2021, August 2). *Samoa confirms China-backed Vaiusu Bay port project shelved*. Retrieved from Radio New Zealand (RNZ): <https://www.rnz.co.nz/international/pacific-news/448264/samoa-govt-confirms-china-backed-port-project-shelved>
- Sammons, A. (2018). *Neo Panamax container ships and their impacts on existing port capacities*. London: Middlesex University.
- Sawlan, G. (2019, March 6). *Solomon Islands may not recover funds from stricken carrier to pay for oil spill clean up, says expert*. Retrieved from ABC Radio Australia - Pacific Beat: <https://www.abc.net.au/radio-australia/programs/pacificbeat/solomon-islands-shipping-legal/10874364>
- Schiffman, R. (2017, June 13). *Polynesian Seafaring Canoe Completes Its Globe-Circling Journey*. Retrieved from SCIENTIFIC AMERICAN, A DIVISION OF SPRINGER NATURE AMERICA, INC.: <https://www.scientificamerican.com/article/fantastic-voyage-polynesian-seafaring-canoe-completes-its-globe-circling-journey/>
- Schuler, M. (2012, December 27). *Matson Expands South Pacific Network, Buys Assets of NZ's Reef Shipping*. Retrieved from G-Captain News: <https://gcaptain.com/matson-buys-assets-of-reef-shipping/>
- Sea News International . (2013, July 10). *Swire acquires all of Polynesia Line, but retains headquarters and old agents*. Retrieved from Sea News International : <https://www.seanews.com.tr/swire-acquires-all-of-polynesia-line-but-retains-headquarters-and-old-agents/106626/>
- Secretariat of the Pacific Community. (2015). *Supporting Safe, Efficient and Sustainable Maritime Transport Systems Draft Report*. Washington D.C.: The World Bank.
- Slack, B., & Gouvernal, E. (2011). Container freight rates and the role of surcharges,. *Journal of Transport Geography*,, Pages 1482-1489,.

- Sol, J. (2018). International Port Development Cooperation Program. (p. https://www.unescap.org/sites/default/files/ROK_CBStrengthening%20Transport_March.pdf). Republic of Korea Ministry of Oceans and Fisheries and UN ESCAP.
- SPA. (2020). *Samoa Port Authority (SPA) Annual Report*. Apia: Samoa Government .
- SPC. (2006). *Regional Maritime Programme Strategic Plan 2006-2010*. Secretariat of the Pacific Community. Suva: SPC.
- SPC. (2015). *Pacific Islands Supporting Safe, Efficient and Sustainable Maritime Transport Systems Improving Ports and Maritime Shipping*. World Bank. Washington DC: World Bank.
- SPC. (2018). *Central Pacific Shipping Commission (CPSC)*. Retrieved from SPC : <https://gem.spc.int/projects/central-pacific-shipping-commission-cpsc>
- SPC. (2019). *Regional Strategy for Pacific Women in Maritime 2020-2024*. Suva, Fiji: Pacific Community.
- SPC. (2019, August). The Pacific Community Governance Compendium. <https://spccfpstore1.blob.core.windows.net/digitallibrary-docs/files/8d/8d6bdf57f8a8e0f18144bf69200db7c4.pdf?sv=2015-12-11&sr=b&sig=TAwoNs%2FEXNOs5sok9UP%2F3vIV7haHy8s6PhgHGk9PxWU%3D&se=2022-05-30T01%3A03%3A52Z&sp=r&rsc=public%2C%20max-age%3D864000%2C%20>. Noumea, New Caledonia: The Pacific Community.
- SPC. (2021). *Geoscience, Energy and Maritime Division (data for Nauru and Tuvalu)*. Suva: The Pacific Community (SPC).
- SPC. (n.d.). *Central Pacific Shipping Commission (CPSC)*. Retrieved December 2021, from Pacific Community – Geoscience, Energy and Maritime Division: <https://gem.spc.int/projects/central-pacific-shipping-commission-cpsc>
- SPREP. (2016). *Cleaner Pacific Strategy 2025: Pacific Regional Waste and Pollution Management Strategy 2016-2025*. Apia: Secretariat of the Pacific Regional Environment Programme (SPREP).
- SPREP. (2019). Agenda Item 12.3.3: Maritime Pollution Emerging Issues. *29th SPREP MEETING 'A Resilient Blue Pacific' 3-6 September 2019*, (pp. https://www.sprep.org/sites/default/files/29-SPREP-Meeting/New/Eng/WP%2012.3.3%20Maritime%20Pollution%20Emerging%20Issues_FINAL.pdf). Apia.
- SPREP. (2019, September). *Maritime Pollution Emerging Issues*. Retrieved from The Secretariat of the Pacific Regional Environment Programme: https://www.sprep.org/sites/default/files/29-SPREP-Meeting/New/Eng/WP%2012.3.3%20Maritime%20Pollution%20Emerging%20Issues_FINAL.pdf
- SPREP. (2021). *Noumea Convention*. Retrieved December 2021, from Secretariat of the Pacific Regional Environment Programme: <https://www.sprep.org/convention-secretariat/noumea-convention>
- SSATPP. (2013). *Port and Maritime Transport Challenges in West and Central Africa*. Bamako: Sub-Saharan Africa Transport Policy Program.
- Tarte, S. (2015). Chapter 7: A New Pacific Regional Voice? The Pacific Islands Development Forum. In G. Fry, & S. Tarte, *The New Pacific Diplomacy* (pp. <http://press-files.anu.edu.au/downloads/press/p328371/html/ch07.xhtml?referer=&page=15#>). Canberra: ANU Press.
- The Library of U.S. Congress . (2010, April 19). *Tonga: Royal Commission Report on Princess Ashika Ferry Disaster*. Retrieved from The Library of U.S. Congress : <https://www.loc.gov/item/global-legal-monitor/2010-04-19/tonga-royal-commission-report-on-princess-ashika-ferry-disaster/>
- The Maritime Executive. (2020, March 13). *Neptune Pacific Line Acquires Pacific Direct Line*. Retrieved from The Maritime Executive.: <https://maritime-executive.com/corporate/neptune-pacific-line-acquires-pacific-direct-line>
- The Pacific Blue Shipping Partnership. (2021, May). *Concept Note*, <https://mcst-rmiusp.org/index.php/reference-library-main?task=download.send&id=596&catid=38&m=0>. Republic of Fiji & Republic of the Marshall Islands.

- Tolvanen, S., Thomas, K., Lewis, T., & McCoy, M. (2019). *Assessing the contribution of landings from locally based commercial tuna fishing vessels to food security*. Honiara : Forum Fisheries Agency (FFA).
- UNESCAP. (2021). *Report on Sustainable and Resilient Port Development*. Bangkok: UNESCAP.
- UNESCAP, (2021), *Smart Port Development for sustainable maritime connectivity in Asia and the Pacific*, Bangkok UNESCAP”
- UNCTAD. (2007). *ISPS CODE IMPLEMENTATION, COSTS AND RELATED FINANCING* . Geneva: UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT (UNCTAD).
- UNCTAD. (2013). *Case Study: The Pacific Islands - Turning losses into gains: SIDS and multilateral trade liberalisation in agriculture*. Geneva: The United Nations Conference on Trade and Development (UNCTAD).
- UNCTAD. (2014). *Closing the Gap - Partnerships for sustainable and resilient transport systems in SIDS*. Geneva: UNCTAD.
- UNCTAD. (2014). *Maritime Transport in Small Island Developing States - REVIEW OF MARITIME TRANSPORT*. Zurich: UNCTAD.
- UNCTAD. (2016). *Trade Facilitation and Development: Driving Trade Competitiveness, Border Agency Effectiveness*. Geneva: UNCTAD.
- UNCTAD. (2019). *Trade and vulnerability* . Geneva: UNCTAD Trade and Development Board Trade and Development Commission.
- UNCTAD. (2020). *COVID-19 and maritime transport: Impact and responses*. Geneva: UNCTAD/DTL/TLB/INF/2020/1.
- UNCTAD. (2021, December 1). *Container port traffic (TEU: 20 foot equivalent units)*. Retrieved from WB Port Statistics - UNCTAD ([unctad.org/en/Pages/statistics.aspx](https://data.worldbank.org/indicator/IS.SHP.GOOD.TU)): <https://data.worldbank.org/indicator/IS.SHP.GOOD.TU>
- UNCTAD. (2021). *Review of Maritime Transport 2021*. United Nations Conference on Trade and Development. New York: United Nations.
- UNCTAD. (2021). *UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT Report*. Geneva: UNCTAD 2021.
- UNDESA. (2019, July 10). - *A quarter of Pacific islanders live below ‘basic needs poverty lines’, top UN development forum hears*. Retrieved from UN NEWS - United Nations Department of Economic and Social Affairs (UNDESA): <https://www.un.org/development/desa/en/news/sustainable/hlpf-2019-pacific-islands-forum.html>
- UNESCAP. (2019). *Review of Sustainable Transport Connectivity in Asia and the Pacific*. Bangkok: The Economic and Social Commission for Asia and the Pacific (ESCAP).
- UNESCO. (2018). *UNESCO Pacific Strategy*. Paris: UNESCO Office for the Pacific States - United Nations Educational, Scientific and Cultural Organization.
- UNESCO. (2019, April 4). *Update on East Rennell oil spill, Solomon Islands*. Retrieved from United Nations Educational, Scientific and Cultural Organization (UNESCO): <https://whc.unesco.org/en/news/1948>
- UNESCWA. (2019). *PPP for Ports Development and Operation_Final Report*. Beirut: United Nations Economic and Social Commission for Western Asia UNESCWA.
- UNFAO. (2021, December 1). *FAO Food Price Index*. Retrieved from World Food Situation: <https://www.fao.org/worldfoodsituation/foodpricesindex/en/>
- UNFPA PSRO. (2014). *population and development profiles Pacific Island Countries*. Suva: United Nations Population Fund - Pacific Sub-Regional Office.
- UNOCHA. (2021, November 3). *Maritime Policy and Legal Adviser*. Retrieved from The United Nations Office for the Coordination of Humanitarian Affairs UNOCHA: <https://webcache.googleusercontent.com/search?q=cache:Cxbs75F8LhgJ:https://reliefweb.int/job/3788113/maritime-policy-and-legal-adviser+&cd=4&hl=en&ct=clnk&gl=au>

- UNWMO. (2021). *Case study – The Rabaul Queen tragedy, 2 February 2012*. Geneva: UN World Meteorological Organization UNWMO.
- Van Niekerk, H. (2005). Port Reform and Concessioning in Developing Countries. *The Journal of Maritime Economics and Logistics*, 141 - 155.
- VDP. (2020, December 17). *IPDS Pays Vt25 Million Dividend to Government and Ifira Trustees*. Retrieved from Vanuatu Daily Post, Port Vila (VDP): https://www.dailypost.vu/news/ipds-pays-vt25-million-dividend-to-government-and-ifira-trustees/article_f758e012-3fef-11eb-a16b-d3e790df4332.html
- VPMU. (2018, February 23). *Lapetasi, an exemplary wharf project*. Retrieved from Vanuatu Project Management Unit, Prime Minister's Office,: <https://vpmu.gov.vu/index.php/news/158-lapetasi-completion-an-example-of-great-team-effort>
- VSNO. (2020, DECEMBER 1). *VSNO 2020 population estimates*. Retrieved from Vanuatu National Statistics Office: <https://vnso.gov.vu/index.php/en/census-and-surveys/census/2020populationhousingcensus>
- Weinstein, D. (2015). Domestic Passenger Ship Safety in the Pacific – Backgrounder for PRIF Transport Sector Working Group July 2015. Wellington: unpublished.
- WFP / Logistics Cluster. (2021, december 1). *WFP / Logistics Cluster*. Retrieved from Logistics Cluster Coordination Inter-Agency Standing Committee: https://cdn.logcluster.org/public/pacific_logistics_cluster_shipping_operations_update_200429.xlsx
- WITS. (2021, December 1). *Fuel imports (% of merchandise imports) - Pacific island small states - World Bank staff estimates through the WITS platform from the Comtrade database maintained by the United Nations Statistics Division*. Retrieved from World Bank - World Integrated Trade Solution (WITS) : <https://data.worldbank.org/indicator/TM.VAL.FUEL.ZS.UN?locations=S2>
-).
- World Bank. (2006). *The Pacific Infrastructure Challenge A review of obstacles and opportunities for improving performance in the Pacific Islands*. Washinton, DC: The World Bank Group.
- World Bank. (2021). A Blue Transformation for Maritime Transport in the Pacific Terms of Reference (TOR) for Advisory Services and Analytics (ASA) Consultancy Services. The World Bank.
- World Bank. (2021, September). *Debt & Fiscal Risks Toolkit – Debt Sustainability Analyses*. Retrieved December 2021, from The World Bank: <https://www.worldbank.org/en/programs/debt-toolkit/dsa>
- World Bank. (2021, December). *Projects & Operations*. Retrieved December 2021, from The World Bank: <https://projects.worldbank.org/en/projects-operations/projects-home>
- World Bank. (2021). Strengthening of the Pacific Blue Shipping Partnership (PBSP) and development of a Multi-Country Nationally Determined Contribution (NDC) for the maritime sector in the Pacific. *A Blue Transformation for Maritime Transport in the Pacific Terms of Reference (TOR) for Consultancy Services*. The World Bank.
- World Bank Group. (2015). *Supporting Safe, Efficient and Sustainable Maritime Transport Systems Improving Ports and Maritime Shipping*. Washington D.C: World Bank Group.
- World Bank Meta-Data . (2021, December 1). *Global Development Indicators* . Retrieved from Population Data Totals: <https://data.worldbank.org/indicator/SP.POP.TOTL>
- Worrell, D. (1992). Economic Policies in Small Open Economies:. *Prospects for the Caribbean, Economic (London: Commonwealth Secretariat, P.23*.
- Yehuda, H. (1982). The Port-Urban Interface: An Area in Transition. Hayuth, Yehuda. *“The Port-Urban Interface: An Area in Transition.” Royal Geographical Society (with the Institute of British Geographers), Wiley], Area, vol. 14, no. 3, PP 219 -224.*

