

Adapting tuna-dependent Pacific Island communities and economies to climate change

Study 9: Identification of financing mechanisms, supporting policies and capacity needs to sustain the benefits achieved through investment by GCF

Part 2. Assess the scope for governments of participating countries with hubs for the transshipment of purse-seine catches to regulate these operations and capitalize on these activities in new ways to sustain access to tuna for the food security of urban communities.

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Executive summary

Component B of the Green Climate Fund (GCF) Regional Tuna Programme (RTP) titled: Adapting tuna-dependent Pacific Island communities and economies to climate change, under RFP22-3866 addresses the need to manage the challenges associated with national food security.

Traditionally, much of the fish consumed in the Pacific Island region has come from coastal fisheries, which are based mainly on coral reefs. Climate change is adversely affecting the Western and Central Pacific Ocean large marine ecosystem, degrading its coral reefs and changing the distribution of tuna. The impacts on coral reefs are reducing the supply of reef fish and threatening the food security of more than four million people that live along the coasts of the 14 Pacific Island Countries (PICs) targeted in the RTP. In parallel to the threat to the food security of highly vulnerable populations, the redistribution of tuna will have profound implications for national economies that derive as much as 70% of their (non-aid) government revenue from tuna fishing, thereby dramatically reducing basic social services that are essential to the resilience of Pacific Island people.

With abundant off-shore tuna resources, there is an opportunity to increase the availability of good quality and affordable tuna to Pacific Island populations through increased utilisation of landings of by-catch and small/damaged tuna (hereafter referred to as by-catch) from purse seine transshipment operations. Increasing by-catch from transshipment does, however, come with several caveats. Planning for the year-on-year variability in transshipment volume caused by the El Nino Southern Oscillation (ENSO) conditions and operational decisions by industry, and the potential for such landings to adversely affect local fishers if pricing and sales are not managed requires careful consideration. Additionally, there are practical challenges that need to be overcome to ensure any such landings can be brought ashore, stored, and marketed according to established food safety standards.¹ In addition, strong consumer preference for reef fish over pelagic fish in some countries can cause low demand for by-catch and tuna sourced from commercial operations meaning investment and distribution options stimulate low interest as alternative food sources or to support livelihoods and enterprise.

Technical Studies 2 and 5 of the RTP have quantified future seafood protein needs and reviewed logistical, infrastructure and distribution, considerations associated with transshipment hubs in relation to current and future needs of PICs. This Study builds on these findings by reviewing country-by-country approaches and suggesting supporting policies that will enable the delivery of by-catch and support the infrastructure investments in the RTP Participating PICs where transshipments take place to improve the availability of by-catch to assist in addressing threats to national food security. This Study also introduces options for finance mechanisms and supporting capacity building needs that provide the potential for funding these investments beyond the RTP.

The Western and Central Pacific Fisheries Commission (WCPFC) regulates by-catch on the high seas in the Convention Area by prohibiting dumping of by-catch at sea under CMM 2022-01 but does not explicitly

¹ Green Climate Fund 2021, Pacific Concept Note. Accessed in August 2023.
<https://www.greenclimate.fund/document/adapting-tuna-dependent-pacific-island-communities-and-economies-climate-change>

mention non-tuna by-catch. In addition, the PIC Coastal States have varied policy approaches to by-catch landing ranging from compulsory requirements, to an optional undertaking to full prohibition.

Given that some of the required infrastructure needs often take a long-time to materialize and might well fall outside the capacity of the RTP to implement (roads, wharves) more immediate decisions will be required to secure short to medium-term benefits of increased access to, and utilization of, tuna and by-catch transshipped from industrial-scale fishing to contribute to national food security. The use of by-catch for local micro canning and methods to provide products that extend shelf life and do not compete with local fishers has been trialed with mixed results.² If this is not a feasible option and where the delivery of by-catch to urban populations is not possible, or the demand for direct by-catch use is low, there is an option to maximize the benefit of by-catch for other purposes such as fish meal, poultry or other animal feeds. Policy gaps to improve the local utilisation of by-catch will need addressing together with the development of national strategies for promoting the use of by-catch either as a primary source of direct food or prioritizing its secondary uses for fish and animal feed.

Investment in the required by-catch collection, storage and distribution infrastructure is difficult to attract and will require a country-specific approach based on the local demand and other factors. Based on future discussions with the RTP participating countries and their willingness to make the necessary policy changes as well as consider the potential development of a 'protein hierarchy' strategy, the detailed assessment of the infrastructure needs and costs will be based on the strategy chosen. The investment needs will depend on whether the transshipped tuna and by-catch is prioritized for direct consumption or other uses such as fish meal for local agriculture and aquaculture depending on supply/demand and the need to protect local fishers and their livelihoods. Given the low level of demand in some of the high-volume locations, the secondary uses of by-catch are an important consideration for the overall increased use of tuna resources to ensure no by-catch is wasted and that it can contribute to increased food security.

A combination of port infrastructure and a long-term supporting regulatory and policy environment will potentially be required to incentivize by-catch offloading in PIC ports. This may include attracting international investment in the required infrastructure and possible national and SMEs investment in distribution, storage and processing. Governments may need to consider prioritizing the use of tuna bycatch as an important source of food security and potential for local economic opportunities especially if direct human consumption in urban centers is going to be logistically and economically possible. Proven finance models for the sector and required investments are largely lacking and will require policy-driven direction. It will be important to co-invest in infrastructure that will benefit other sectors as well and provide broader food security-based benefits for the country. The secondary uses of by-catch, such as fish or animal meal, are likely going to be easier to put into place and attract SME involvement in the short-term in the countries where there is also limited demand of by-catch for human consumption. The secondary uses are also more likely to attract private investment if existing business models of fish meal and other products already exist locally and the upfront costs are less than those needed for direct human use of by-catch.

² FFA. 2019. *Small-scale tuna canning in Plau starts next week*. Accessed in September 2023, <https://tunapacific.ffa.int/2019/09/20/small-scale-tuna-canning-training-in-palau-starts-next-week/>

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List of acronyms and abbreviations

AUD	Australian dollar
AWS	Advance Warning System
COP	Conference of Parties
CPPL	Central Pacific Producers Limited
EEZ(s)	Exclusive economic zone(s)
ENSO	El Nino Southern Oscillation
FAD(s)	Fish aggregating device(s)
FAO	Food and Agriculture Organization (of the United Nations)
FAME	Fisheries, Aquaculture and Marine Ecosystems
FFA	Forum Fisheries Agency
FJD	Fijian dollar
FSM	Federated States of Micronesia
FOFA	The Fishermen of Funafuti Association
GCF	Green Climate Fund
IDF	International Development Finance
kg	Kilogram
KFL	Kiribati Fisheries Limited
KI	Kiribati
KMI	Kendal Micronesia Inc.
km	Kilometre
km ²	Square kilometres
KPA	Kiribati Port Authority
LCD	Least Developed Countries
m	Metre
MAF	Ministry of Agriculture and Fisheries
MIMRA	Marshall Islands Marine Resource Authority
MH	Marshall Islands
mt	Metric ton (or tonne)
NAFICOT	National Fishing Corporation of Tuvalu
NCD	Non communicable disease
NFA	National Fisheries Authority
NFMRA	National Fisheries and Marine Resource Authority
NGO	Non-Government Organisation
NORMA	National Oceanic Resource Management Authority
nm	Nautical mile
NZD	New Zealand dollar
PNG	Papua New Guinea
PGK	Papua New Guinea Kina
PICs	Pacific Island countries
PICTs	Pacific Island countries and territories
PNA	Parties to the Nauru Agreement
PNMS	Palau National Marine Sanctuary
PPF	Pan Pacific Foods
RMI	Republic of Marshal Islands
RFP	Request for proposals
SI	Solomon Islands

SIDS	Small Island Developing States
SBD	Solomon Islands dollar
SDG	Sustainable Development Goals
SPC	Pacific Community
SME	Small medium enterprise
SST	Sea surface temperature
TFD	Tuvalu Fisheries Department
TNC	The Nature Conservancy
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
USD	United States dollar
VDS	Vessel Day Scheme
WB	World Bank
WCPFC	Western and Central Pacific Fisheries Commission
WCPO	Western and Central Pacific Ocean
WHO	World Health Organisation

1. Introduction

Traditionally, much of the fish consumed in the Pacific Island region has come from coastal fisheries, which are based mainly on coral reefs. With a decline in reef fish catches and population growth a larger volume of national requirements are sourced from imported and processed foods. These processed foods are contributing to the health crisis of non-communicable diseases in the region and there is an urgent need to address the gap in the supply of fresh fish (see Study 2). Climate change is also further predicted to adversely impact the productivity of coral reef ecosystems and their capacity to contribute to national food security.³ With abundant offshore tuna resources, there is an opportunity to increase the availability of good quality and affordable tuna to Pacific Island populations to address the gap between protein demands of growing populations and the capacity of alternative sources of protein, particularly coral reefs, to fill it. However, there is a common perception⁴ that the current foreign export-focused fisheries, whilst increasingly economically beneficial to the region, do not currently contribute sufficiently to local food security.

One of the three priority areas of work of the proposed RTP is to increase the availability of tuna and by-catch from industrial purse seine tuna fishing⁵ and associated transshipment operations to local populations. This builds on the Pacific Island Forum (PIF) Fisheries Ministers 'Regional Roadmap for Sustainable Pacific Fisheries,' which sets ambitious 10 year targets and includes increasing the supply of tuna for domestic consumption by 40,000 metric tonnes (mt) across the region by 2024.⁶ This RTP will: 1) increase the supply of tuna for domestic consumption as an adaptation to the degradation of coral reefs and the resulting food insecurity for vulnerable populations; and 2) usher in the reforms needed to minimize the risks for citizens of countries with economies that are vulnerable to climate-driven redistribution of tuna.

However, increasing by-catch and small/damaged tuna (hereafter referred to as by-catch) landings from transshipment comes with several caveats. Planning for the year-on-year variability in transshipment volume caused by the El Nino Southern Oscillation (ENSO) conditions and operational decisions by industry, and the potential for such landings to adversely affect local fishers if pricing and sales are not managed requires careful consideration. Additionally, there are practical challenges that need to be overcome to ensure any such landings can be brought ashore, stored, and marketed according to established food safety standards.⁷ In addition, strong consumer preference for reef fish over pelagic fish

³ Toth, L.T., Aronson, R.B., Vollmer, S.V., Hobbs, J.W., Urrego, D.H., Cheng, H., Enochs, I.C., Combosch, D.J., Van Woesik, R. and Macintyre, I.G. 2012. ENSO drove 2500-year collapse of eastern Pacific coral reefs. *Science*, 337(6090), pp.81-84.

⁴ Pacific Forum Sec 2016. Forum Communiqué. <https://www.forumsec.org/wp-content/uploads/2016/09/2016-Forum-Communiqué-Pohnpei-FSM-8-10-Sept.pdf>

⁵ Although this study is focussed on purse seine transshipments the ports in many FFA member countries support unloading by longliners which also offer opportunities for non-premium grade export quality fish to make a contribution to addressing national food security concerns. Tonga is an example where there is a formal requirement for a proportion of a vessel's catch to be made available to local markets on unloading at Nuku álofa.

⁶ SPC. 2015. Regional roadmap for sustainable fisheries. https://www.spc.int/DigitalLibrary/Doc/FAME/Brochures/FFA_SPC_2015_Roadmap.pdf

⁷ Green Climate Fund 2021, Pacific Concept Note. Accessed in August 2023. <https://www.greenclimate.fund/document/adapting-tuna-dependent-pacific-island-communities-and-economies-climate-change>

in some countries can cause low demand for by-catch and tuna sourced from commercial operations meaning investment and distribution options stimulate low interest.

Given the predicted changes and availability of reef fish in many parts of the Pacific, it is timely to review how policy changes and supporting investments can both create a better reputation and acceptance of transshipped by-catch as a protein source and minimize unwanted consequences such as competition with local fishers. It is important to avoid uneconomical or time-consuming policy and regulatory requirements on industry to help ensure the region is ready to adapt to changing fishing and transshipment patterns and distribution of fish to address threats to national food security.

There have been several previous studies in the region that have looked at the options over the years for coastal States to benefit from transshipments,⁸ the distribution and leakage of tuna from transshipments⁹ as well as the policy options available for countries to increase tuna available for food security.¹⁰ However, little to no progress has been made in terms of policy changes that support increased food security benefits and no major investments have taken place to facilitate the distribution of by-catch, indicating the low priority status of this matter within the region to date. This is despite the commitments made to improve food security by PIF Ministers and the 2024 target of 40,000 mt of tuna being made available for domestic consumption in PICs.

Study 2 and Study 5 of the RTP have quantified future seafood protein needs and reviewed logistical, infrastructure and distribution considerations associated with transshipment hubs in relation to current and future needs for domestic protein requirements. This study builds on these findings by suggesting supporting policies that will enable the delivery of by-catch and support infrastructure investments in the RTP PICs where transshipments take place. This study also introduces options for finance mechanisms that provide the potential for funding these investments beyond the RTP.

2. Supporting policies for transshipments programs to increase tuna available locally

2.1. Analysis of incentives for (or mandating) purse-seine vessels operating in the exclusive economic zones to offload bycatch in coastal State ports

The Western and Central Pacific Fisheries Convention mandates that purse seine transshipments will take place within territorial waters consistent with applicable national laws, aside from special exemptions granted by the Commission.¹¹ The WCPFC CMM 2022-01 para 29, states: *to create an incentive to reduce the non-intentional capture of juvenile fish, to discourage waste and to encourage efficient utilization of fishery resources, CCMs shall require their purse seine vessels fishing in EEZs and on the high seas within the area bounded by 20oN and 20oS to retain on board and then land or transship at port all bigeye, skipjack, and yellowfin tuna.*¹² The Parties to the Nauru Agreement (PNA) 3rd Implementing Agreement

⁸McCoy, M. (2012) *A Survey of Tuna Transshipment in Pacific Island Countries: Opportunities for Increasing Benefits and Improving Monitoring*. FFA Report, July 2012.

⁹Tolvanen, S., Thomas, K. and Lewis, T. (2021), *Assessing the contribution of landings from in-port transshipment to food security in the Pacific*, FFA Report.

¹⁰ MRAG Asia Pacific (2022), *Policy Options to Increase the Contribution of Tuna Fisheries to National Food Security Across FFA Members*. Report prepared for the Forum Fisheries Agency. 75 p.

¹¹ [WCPFC transshipment regulation](#)

¹² [CMM 2021-01](#)

(3IA) only refers to the retention of tuna species caught by purse seine vessels but does not specify transshipment, landing or other requirements for by-catch.¹³ The regional agreements therefore currently do not mandate the landing of non-tuna by-catch species leaving a gap in regulations and a need to update the CMM 2021-01 to specifically include by-catch in the CMM as a means to address regional food security needs and encourage the full utilization of catch.

Aside from vessels that operate 'domestically', landing catch for local processing and/or markets, transshipment locations are in general decided by proximity to the fishing ground. Other considerations include fees and regulatory stipulations that affect the ease of doing business. Secondary considerations include the availability and diversity of vessel port services such as supplies, net making, engineering and entertainment options. Ease of doing business and the onshore facilities are the main incentives to encourage visits and potentially mean that all other things being equal, some hubs such as Majuro are more popular than alternatives with less developed facilities.¹⁴

There are some examples where PNA countries are encouraging local landings via Vessel Day Scheme (VDS) discount rates to support 'domestication policies' meant to provide the raw material for onshore processing. PNG, for example, has offered a discount on VDS days. The discount amounted to 111 million USD in one year and was designed to ensure that 100% of the fish caught within the Exclusive Economic Zone (EEZ) was landed locally for onshore processing. However, the landed amount was only 20% of the total EEZ catch for that year resulting in some vessels benefitting from the discount which then created a secondary market for VDS days by some companies (profiting the local company given a discounted rate).¹⁵ This underlines the need for effective compliance monitoring of any incentive scheme designed to stimulate use of local ports and ancillary services.

VDS discounting to encourage transshipment requires detailed economic and cost-benefit analysis. For countries with no processing or immediate need for by-catch for food security, there is likely to be little economic basis to offer such discounts, especially if the purpose is solely to increase by-catch landing as the value of the product is low.

Based on reports from studies 2 and 5 countries with immediate food security needs as a basis to encourage transshipment and the landing of by-catch caught in their EEZs can be determined. According to the current assessments Solomon Islands, Papua New Guinea and Kiribati have the largest need to ensure increased by-catch delivery locally.¹⁶ There is adequate rationale for offering small VDS discounts in these countries as an incentive for local landings of tuna and bycatch. The greater national benefit would be secured by following the example of Kiribati and requiring by-catch to be landed locally as a condition of licensing conditions. Such provisions need to be accompanied by the necessary collection and distribution investments (see study 5) and capacity to enforce compliance to ensure its implementation.

Despite WCPFC CMM 2022-01, in practice if local laws prohibit landing or if no local collection takes place, by-catch and small tuna that is not economical to transship are dumped overboard according to industry informants. There are minimal apparent implications for transshipment operations themselves if there is a requirement to separate tuna and by-catch for local distribution. Appropriate incentives should lead to an increase in the availability and utilization of tuna and by-catch to local communities during

¹³ [PNA 3IA](#).

¹⁴ Personal Communication M Brownjohn (July 2023)

¹⁵ Interview with a PNA member (July 2023)

¹⁶ Ref: Study 5

transshipment. It is critical to ensure that such requirements do not take time from the crew conducting the transshipment and that the removal of the by-catch is facilitated promptly. Supply of provisions such as fruit and vegetables and other provisions or small services may well cover the gratuity needed as the product is of low economic value and otherwise wasted.¹⁷

Current forecasts and projections suggest that climate-induced redistribution of tuna will have different implications for different countries.¹⁸ To secure long-term economic benefits, including in relation to food security and livelihoods, RTP PICs should assess the potential for a regional approach to managing transshipment activity to optimize the availability of tuna and by-catch for increasingly vulnerable communities. It is within the collective capability of the PNA to mandate offloading requirements of licensed commercial vessels to contribute to national food security needs in a way that no individual PNA member is disadvantaged. Precedents for this include the PNA's conditions of access being linked to an undertaking by licensed vessels not to transship on the high seas.

2.2 Analysis on the potential for the prohibition of discards of bycatch species caught by purse-seine fishing and monitoring compliance with such requirements

The WCPFC Convention as well as the PNA 3IA mandate that vessels are not allowed to discard small or undersized skipjack, yellowfin or bigeye tuna at sea and that both small and undersized fish have to be retained (apart from the last haul of the trip and fish unfit for human consumption).¹⁹ The regulations do not currently cover non-tuna by-catch and will need updating in this regard (see 2.1). However in practice, if the port does not allow for the by-catch to be landed, as well as actively facilitate its offloading, vessels are reported to dump the fish at sea as there is no other alternative.²⁰ The lack of adequate economic incentives, and the cost associated with disposing of fish unloaded for dumping in port, whether that be undertaken by government agencies or the private sector, is a significant impost that does not currently generate a national benefit.

The approach taken to landing by-catch from transshipment vessels varies greatly between Pacific countries. Regulation of the practice ranges from banning landings, with varying degrees of adherence (FSM and RMI) to mandating them under vessels' license conditions (Kiribati) (see 2.3 for individual country summaries). In some cases, there are no regulations for landings from transshipment under fisheries legislation (Solomon Islands, Papua New Guinea) but it is practiced unofficially and mainly unaccounted for despite the large dependency of the urban population on the by-catch as a contribution to food security.

In practical terms, until all the countries have found a way to; a) allow by-catch landing and sales in their territory in a way that does not impact local prices and fisher livelihoods, b) have established facilities to

¹⁷Tolvanen, S., Thomas, K. and Lewis, T. (2021), *Assessing the contribution of landings from in-port transshipment to food security in the Pacific*, FFA Report.

¹⁸ Bell, J.D., Senina, I., Adams, T. *et al.* (2021), Pathways to sustaining tuna-dependent Pacific Island economies during climate change. *Nature Sustainability*, **4**, 900–910.

¹⁹ [CMM 2021-01](#)

²⁰Tolvanen, S., Thomas, K. and Lewis, T. 2021. *Assessing the contribution of landings from in-port transshipment to food security in the Pacific*, FFA Report.

ensure hygienic handling and distribution of by-catch, and c) have attracted SME to operate processing, distribution and sales, the discard prohibition, even if enshrined in regional and national regulations, cannot be adequately enforced.

Once the regulatory requirements are in place, together with the required infrastructure needs and SME distributors, the compliance with regulations and requirements for increased landings from the commercial vessels for domestic consumption will need to be routinely monitored and reported against. To effectively achieve this additional resourcing will be required to support the extension of services provided by fisheries observers, transshipment monitoring staff, port inspectors and data reporting and analysis.

The policy changes to prohibit discards and allow by-catch landing in all of the participating countries should follow a detailed strategy development as explained in 2.2.1 below.

2.2.1 Alternative policy options to support local landing of by-catch

Below is a summary of some examples where governments have regulated the access of commodities to the market with a view to a) ensuring affordable local commodity access, and b) mitigating harm to local producers that can be drawn from considering appropriate courses of action available to PICs in respect of transshipped fish intended for local consumption.

One such policy is the Western Australian Domestic gas policy which requires exporters to release 15% of the gas they produce to the domestic market at a certain price.²¹ Many Asian countries also regulate domestic rice prices and exports in this manner to ensure domestic food security.²² Similarly in Tonga, it is a requirement for locally based tuna fleets (longline) to land 30% of their catch to the local market.²³ If governments kept account of their protein production and consumption, they could establish similar policies to ensure an adequate supply of by-catch, or fresh tuna from locally based fleets, for their needs and require the landing of by-catch/tuna in their national policy and licensing conditions for the use in direct human consumption when needed and desired, or for the production of secondary protein in animal and fish feed.

The governments with transshipment hubs or domestic tuna industry should consider a more detailed strategy on the full use of the by-catch. For countries with high demand such as the Solomon Islands, PNG and Kiribati, all by-catch can be prioritized for direct human consumption. For other countries with less demand such FSM, RMI and others, authorities should monitor fish prices and availability (and promote tuna and by-catch consumption as per Technical Study 2) and at times of high demand for by-catch, allow transshipped by-catch for sale in the local markets. At other times, governments could prioritize by-catch for fish and animal feed production to support the secondary protein sources domestically, maximize food security benefits and ensure by-catch is not wasted.

In this 'protein hierarchy' fresh fish/by-catch, be it from locally based fleets or transshipment by-catch, would, as a priority, be distributed to local populations when other protein access is low and there is

²¹ Western Australian Government 2023. *Western Australia Domestic gas policy*. Accessed November 2023. <https://www.wa.gov.au/government/publications/wa-domestic-gas-policy>

²² Bishwajit, G., Sarker, S., Kpoghomou, MA. *et al.* 2013. Self-sufficiency in rice and food security: a South Asian perspective. *Agric & Food Secur* 2, 10 (2013)

²³Tolvanen, S., Thomas, K., Lewis, T. and McCoy, M. 2019. *Assessing the contribution of landings from locally based commercial tuna fishing vessels to food security*, FFA Report.

demand and at other times utilized for the fish/animal feeds. In this way harm to local fisher livelihoods is minimized but the populations are still as priority provided fresh food over processed imports. This would require the infrastructure and resources to store and distribute the fish as well as capable SMEs and investments into the fish meal plants that will allow for secondary uses of the by-catch and potential development of the domestic fish farming and poultry industry as alternative proteins (see Study 5).

2.3 Analysis of current policies in place

The accompanying summary of the status of tuna purse seine transshipment activity²⁴ in each of the Participating Countries is based on previous 2021 research.²⁵ Information was collated from responses to questionnaires sent to the participating countries, additional information from recent country consultations, Study 5, as well as information directly sought from experts (see Appendix 1).

2.3.1 Federated States of Micronesia

Current policy

Federated States of Micronesia (FSM) law (Title 24 FSM Code) prohibits licensed tuna fishing vessels, both foreign and domestic flagged, from selling any of their catch to local markets. This also includes the so-called bartering and trading. The prohibition on local sales by commercial tuna vessels was adopted to protect the livelihoods of local tuna fishermen who engage in trolling for skipjack and yellowfin tuna and deep handline fishing for yellowfin tuna within the 12 nm fishing zone. Both national and state laws and regulations prohibit government officers from asking for gifts from those whose actions they regulate, to reduce the scope for corruption. FSM law also prohibits persons from offering gifts to regulators that might be construed as a bribe.²⁶

While it is illegal for boats to gift catch to officials, a limited amount of high-level 'patronage' gifting has been practiced under the approval of the NORMA Executive Director or company CEO in the case of FSM flag vessels. These have been primarily for special official and community functions and are limited.

Future policy considerations

Whilst not necessarily focused on by-catch, needs assessments are currently underway for all four ports in FSM to identify possible infrastructure upgrades such as extensions to port and wharf frontages and cold storage facilities.²⁷

The recent consultation with NORMA as part of the RTP visits indicated that there is interest to revisit the ban on the sale of tuna and by-catch transshipped from commercial vessels but there needs to be a mechanism to ensure that this does not have a negative impact on local food prices and fisher livelihoods. There was a suggestion to support women's associations as a vehicle for distribution. This would require appropriate infrastructure including collection vessels and cold storage to accommodate large volumes of fish.

²⁴ Note Fiji was removed from the review due to infrequent purse seine transshipments and small historical volumes.

²⁵ Tolvanen, S., Thomas, K. and Lewis, T. 2021. *Assessing the contribution of landings from in-port transshipment to food security in the Pacific*, FFA Report.

²⁶ The government staff encompassed by these constraints include fisheries managers, transshipment observers, port officials, boarding officers and fishery observers.

²⁷ Ref: Study 5

In addition, the recent tuna value addition study in the region made a strong recommendation to consider the animal and fish feed industry in FSM for the use of by-catch in a way that would contribute to increased food security but be sensitive to local livelihood concerns and the general population’s preference for other types of fish.²⁸

FSM opportunity summary

Issue	Status	Recommendation
Current policy on by-catch landings	Prohibited	Review this policy based on alternative use of by-catch for animal and fish feed
Future protein needs ²⁹	Not increasing, population predicted to decline	Demand for by-catch likely not going to increase in the short term, no economic basis for direct investments.
Seafood preference	Reef species and fresh fish ³⁰	As above
Concerns for local fisher livelihoods	High concern, local fishers have rejected past proposals to allow by-catch landing	Local fishers role in supplying non-reef based protein should be prioritised (i.e. through a FAD program and shore based infrastructure).
Infrastructure needs for by-catch distribution	Not in place	Due to lack of demand there is currently no basis for large investments. , If aqua/animal feed opportunity is more defined, investments for transport vessels, cold storage and facilities could be made together with investment in small-scale fisher infrastructure (cold storage, landing sites).
Alternative use of by-catch to support food security	Potential for animal and fish feed processing	The local demand for these products should be evaluated in more detail and a business case/incentives provided for

²⁸ Personal communication F. Blaha (July 2023).

²⁹ Ref: Study 5 and Study 2

³⁰ Tolvanen, S., Thomas, K. and Lewis, T. 2021. *Assessing the contribution of landings from in-port transshipment to food security in the Pacific*, FFA Report.

		SME involvement in the use of by-catch.
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2.3.2 Kiribati

Unlike some countries where tuna and/or tuna bycatch informally enter the local market from transshipment operations, this source of fish is part of Kiribati’s formal local tuna supply. The practice of landing bycatch and rejected tuna from vessels transshipping in Kiribati dates back at least to the 1990’s.³¹ Kiribati regulations³² require that landings from transshipment occur via the government-owned Central Pacific Producers Limited (CPPL) and the government joint-venture company Kiribati Fisheries Limited (KFL).

Purse seine fishing licenses issued by Kiribati require local landings from transshipments occurring in Tarawa. However, in reality this practice is negotiable and managed on a case-by-case basis. Through locally-based and foreign purse seiners license conditions transshipping vessels supply CPPL with damaged and/or small tunas, mainly skipjack, as well as bycatch, for sale on the local market in Tarawa.

Reject fish collected by CPPL staff onboard transshipping vessels are transported from the wharf to their shop fronts or cold storage facility (i.e. reefer container) via a truck with the capacity of holding up to ~2 mt. Once the fish is distributed to the two retail fronts in Bikenibeu and Bairiki, it is sold whole and unprocessed. The fish is normally sold quite quickly owing to the competitive price charged – AU\$2.20/kg in 2023, or half the market price of fresh fish.³³ When there is more discarded tuna than the market can absorb (for example after transshipments by the large Korean vessels) the excess is sold for animal feed, as CPPL has limited cold storage capacity. This excess amounted to 3 mt in 2016 reducing to around 1 mt in subsequent years and is used for pig feed.^{34, 35}

Currently bycatch available for local consumption is less constrained by the supply of fish from transshipping vessels and more by infrastructure limitations. It was highlighted by CPPL that in addition to limited cold storage, they do not possess any large collection boats to transport bycatch from purse seine vessels to shore, and the wharf space operated by the Kiribati Ports Authority (KPA) is also limited. For the six months from September 2022 to February 2023, CPPL reported 107 mt of bycatch sold through its fish markets.

As a result of the constraints in the official supply chain, private individuals are still actively involved in the collection and distribution of tuna bycatch from purse seine transshipments despite the regulations against it. Anecdotal accounts suggest that the CPPL markets are closed more often than they are open, with the large portion of tuna bycatch entering Tarawa’s local economy as ‘leakage’ – i.e. informal and unmonitored collection of fish from purse seine vessels by private individuals in small skiffs/canoes and selling the fish at pop-up stands by the side of the road.³⁶

³¹ Fisheries Division, Kiribati (undated, 1990s) [Report on Foreign Fishing Vessels Transshipments in Kiribati](#).

³² Fisheries Division, Kiribati (undated, 1990s) [Report on Foreign Fishing Vessels Transshipments in Kiribati](#).

³³ Ref: study 5

³⁴ Meeting with CPPL, March 2019

³⁵ The study found no information if the by-catch is processed or used as it is for animal feed.

³⁶ Ref: Study 5

Future policy considerations

The in-country consultations indicated that in order to more efficiently distribute by-catch volumes when available there is interest in scaling up the CPPL markets from the current two locations – Bairiki and Bikenibeu.. In addition, logistical problems associated with the lack of reliable collection boats, wharf space and cold storage need addressing. There is good demand in Tarawa for the fish when it is available but the large one-off volumes and lack of cold storage mean some of it is used as pig feed when too spoiled for human consumption. A policy decision could be made to prioritize the direct food security need and appropriate infrastructure gaps addressed.

Kiribati opportunity summary

Issue	Status	Recommendation
Current policy on by-catch landings	License requirement to land by-catch in Tarawa	Strengthen capacity to monitor compliance.
Future protein needs ³⁷	Increasing, urban population growth predicted to increase by 48% by 2050.	Likely severe future protein deficiency unless by-catch volumes and distribution are addressed adequately.
Seafood preference	Mixed	There appears to be a strong demand for economically priced transhipped tuna and by-catch landings.
Concerns for local fisher livelihoods	Medium concern	Given high market demand there appears to be limited competition with local fishers, this should be monitored if by-catch volumes available locally are increased.
Infrastructure needs for by-catch distribution	Landing volumes are limited by lack of appropriate infrastructure	There appears to be a strong need for both transportation vessel(s), additional cold storage as well as additional shop/market capacity.
Alternative use of by-catch to support food security	By-catch currently being used as pig feed when volumes exceed local capacity to store/sell fish	Given high demand by urban populations direct use of by-catch for food security should be prioritised and invested in, not animal feed.

³⁷ Ref: Study 5

	and it spoils, estimated to be only 1 mt in 2021. ³⁸	
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2.3.3 Nauru

Nauru has not been a transshipment hub to date due to a lack of port facilities and the related services required to facilitate transshipment and re-supply operations. It also does not have current regulations in regard to transshipment and landing of by-catch. There is a major port upgrade currently underway in Nauru which was planned to be completed in 2020. The current estimated date for completion was September 2023.³⁹ Once the port is operational Nauru is likely to start attracting purse seine transshipments, especially from vessels active in its EEZ. There is a need to clarify the national regulations in regard to permitting/prohibiting landing. It is likely that given the small local population and the large potential volumes of by-catch at this time, local fisher livelihoods may be impacted and will require considerations as the national strategy is developed. Alternative uses of by-catch as described in chapter 2 may be a necessary consideration for Nauru to balance the need to fully utilize by-catch and the local livelihoods.

2.3.4 Papua New Guinea

The amended National Tuna Fishery Management and Development Plan of 2014⁴⁰ provides the authority to regulate the unloading, transshipment and marketing of all catch including by-catch. Currently there are no other provisions to do so other than the regulation of the use of motherships for at-sea transshipment. In-port transshipment in designated ports is required consistent with the WCPFC ban on at-sea transshipment for purse seine vessels.

There are several ports in which purse seine transshipments and landings take place in PNG. The busiest of these is the Port of Rabaul. As there are no processing facilities in Rabaul, the majority of vessel visits are dedicated to transshipment between purse seiners and fish carriers. In contrast, vessel visits to the other three key ports; Lae, Madang and Wewak are primarily associated with the landing of tuna into the local processing plants.⁴¹

Limited information is available on current trading practices of by-catch in PNG ports but bartering primarily of fruit and vegetables from small vessels (dinghies and canoes) predominates, especially in Rabaul and Wewak. In Lae and Madang, where private wharves service the tuna fleets, minimal leakage reportedly occurs and trading is more regulated under processing company control. Commercial trading of small or damaged tuna and bycatch is regulated in Madang, and partly controlled in two others (Lae and Wewak). In Rabaul there are varying degrees of sorting and leakage but there is no organized commercial trading.

³⁸ Tolvanen, S., Thomas, K. and Lewis, T. (2021), *Assessing the contribution of landings from in-port transshipment to food security in the Pacific*, FFA Report.

³⁹ Green Climate Fund 2017, *Sustainability and climate resilience for Nauru*. Accessed November 2023. <https://www.greenclimate.fund/project/fp052>

⁴⁰ Papua New Guinea Government. 2014. [National Tuna Fishery Management and Development Plan](#)

⁴¹ Ref: Study 5

In Madang the catch is sorted and graded during unloading at the wharf, with damaged or small tuna and non-tuna bycatch species separated, and temporarily parked in the cold storage. Disposal then occurs via canteen utilization in both RD tuna operating locations (Vidar port and Nagada plant) and there are relatively low volume sales through an outlet set up with a local landowner group selling at the compound gate.

Whilst there is local demand at the cannery locations it seems likely that a large proportion of the available tuna and bycatch is discarded in Rabaul during periods of high-volume transshipments.⁴² There are no reports of by-catch reaching Port Moresby or other urban centers.

Future policy considerations

With high priority on tuna fishery domestication and value adding in PNG, the use of by-catch has not received priority attention. Given the high volumes of transshipped and landed purse-seine catch in PNG a key question remains as to how to ensure the by-catch is efficiently collected and processed. In Rabaul and Wewak where cannery operations do not handle by-catch, there is an opportunity to increase access to by-catch. The main constraint relates to an inefficient informal supply chain with virtually no cold chain for the effective distribution of a perishable product. As highlighted in study 5, a multisector infrastructure approach is required to secure appropriate investments as by-catch alone is currently low value and available in limited volumes such that large investments in distribution infrastructure cannot be justified.

Papua New Guinea opportunity summary

Issue	Status	Recommendation
Current policy on by-catch landings	Transshipments in port required but policy does not include provisions for by-catch landings	Policy revision should be prioritised to mandate by-catch landing by licensed vessels similar to Kiribati.
Future protein needs ⁴³	Increasing, urban population growth predicted to increase by 62% by 2050.	Likely severe future protein deficiency unless by-catch volumes and distribution is increased.
Seafood preference	Mixed	Given the population trends and low economic status of urban populations there is likely demand for well-priced by-catch.
Concerns for local fisher livelihoods	Low concern	Given high market demand there appears to be limited competition with local fishers.

⁴² Tolvanen, S., Thomas, K. and Lewis, T. (2021), *Assessing the contribution of landings from in-port transshipment to food security in the Pacific*, FFA Report.

⁴³ Ref: Study 5

		This should be monitored if by-catch volumes available locally are increased.
Infrastructure needs for by-catch distribution	Distribution of by-catch currently limited by the lack of cold storage and adequate supply chain to urban centres.	There is a need for additional cold storage and cold supply chain as well as logistical solutions (road or freezer container transport) to Port Moresby. This is likely to require major government led investments. In addition, wharf space is limited at the current processing sites and will require expansion if landed volumes are to be increased.
Alternative use of by-catch to support food security	No information on current use of by-catch for animal feed but it is usual practise for canneries to produce fish meal from fish waste and potentially also from the unused by-catch.	Until logistical issues are solved, and distribution to local populations is improved, the by-catch should be processed into animal feed. However, given high demand by urban populations direct use of by-catch for food security should be prioritised. As part of the policy revision for by-catch landing, the canneries should be consulted to understand what additional role they can play in ensuring local distribution of by-catch and cold chain support (consider the Noro example in Solomon Islands).

2.3.5 Republic of Marshall Islands

Landing tuna or bycatch from transshipping purse seiners for local sale is officially prohibited in the Republic of Marshall Islands (RMI) under local fisher law.⁴⁴ Unlike in FSM, where landing is prohibited and gifting to officials is prohibited, in RMI the gifting practice for personal use is not specifically regulated. Government officials visiting the ships include fisheries managers, port officials, boarding officers and fisheries observers are all known to receive gifts of tuna and by-catch.

⁴⁴This was confirmed by MIMRA in 2020 but no regulation was ever produced/shown

The local market demand is for reef fish, and local fresh tuna catch is preferred over transshipped frozen and brined fish. Hence, there is no evidence of leaked damaged tuna or large quantities of bycatch at the local market.⁴⁵ As a result of the local ban on commercial trade, and low demand, such fish is usually dumped at sea or utilized by one of the two local fish meal companies, Pan Pacific Foods (PPF) and Kendall Micronesia Inc (KMI). In the case of KMI, which is an agent for purse seine vessels, by-catch is received free or in exchange of fruit and supplies. The fish is processed into fish meal for local milkfish farms. In addition, it is common practice for local fishermen to barter goods for bait fish with the purse seiners.

Future policy considerations

Given the population trends, local fish preferences and local fisher livelihood concerns there is currently no case for immediate policy change or additional investments to facilitate by-catch access for the local population. The use of by-catch for animal and aquaculture feed is already serviced by the local SMEs. Both PPF and KMI utilize the public port and wharf, with PPF collecting the by-catch as part of the unloading process and KMI transporting reject fish from transshipping vessels using their skiffs. The public port is shared with merchant ships delivering goods and supplies to Majuro. These vessels have priority access to the wharf over fishing vessels. This is the only bottleneck identified by officers from the Marshall Islands Marine Resources Authority (MIMRA) regarding fish landed from purse seine vessels to local processors and could be considered for inclusion as part of a planned generic port upgrade in Majuro.⁴⁶

Marshall Islands opportunity summary

Issue	Status	Recommendation
Current policy on by-catch landings	By-catch landings for human consumption are prohibited but individual bartering and gifting is not actively regulated.	It does not appear necessary to revise the regulation at the current time.
Future protein needs ⁴⁷	There is a small (-3%) decline predicted in Majuro's population by 2050. Projected declines in reef fish availability (due to overfishing and habitat loss) means protein needs will have to be met from other sources.	Local food security needs should be monitored and policy changes considered if and when the conditions change.
Seafood preference	Reef fish and fresh tuna	Demand for by-catch is likely not going to increase in the short term. There is currently

⁴⁵ Tolvanen, S., Thomas, K. and Lewis, T. (2021), *Assessing the contribution of landings from in-port transshipment to food security in the Pacific*, FFA Report.

⁴⁶ Ref: Study 5

⁴⁷ Ref: Study 5

		no economic justification for direct investments.
Concerns for local fisher livelihoods	High concern	Local fishers' role in supplying non-reef sourced protein should be prioritised (i.e. through a FAD program and shore-based infrastructure).
Infrastructure needs for by-catch distribution	Wharf space to allow for by-catch collection for aquaculture and animal feed is currently limited.	Consider PPP approach for additional wharf investment that can facilitate by-catch offloading and distribution.
Alternative use of by-catch to support food security	Already active SME sector utilising by-catch for secondary products that support food security.	See above discussion in relation to additional wharf space to support increased use of by-catch.

2.3.6 Solomon Islands

Whilst there are currently no regulations covering transshipment and unloading in the existing Fisheries Management Act (2015), the Tuna Fisheries Management and Development Plan was recently reviewed as part of the Solomon Islands Ministry of Fisheries and Marine Resources (MFMR) Corporate Plan and Strategy 2019 – 2023 and the Solomon Islands National Fisheries Policy 2019-2029. These policy documents aim to ensure the long-term management, conservation, development and sustainable use of Solomon Islands fisheries resources and may contain regulations applying to transshipment and unloading but we were not able to verify the status as part of this study.

There are two main avenues of by-catch sales in the Solomon Islands. Firstly, the Soltuna processing facilities in Noro requires all small and reject tuna and by-catch to be landed at their facility. Study 5 describes the landings, storage and distribution chain in detail. It should be noted that the majority of by-catch is transported overnight to Honiara for sale at to restaurants and through the fish market.

There is also more unofficial trading and bartering of rejected brined and frozen fish set aside during transshipment by industrial purse seiners in Honiara port (locally called saltfish). The saltfish is available for trade and is generally regarded as leakage, as it remains largely outside regulated commercial supply chains. No statistics are available despite the importance of the trade and details remain poorly known. Aspects of the trade in Honiara have attracted attention at various times. This includes concerns relating to possible health risks from poor hygiene - the fish may remain unrefrigerated/not iced for long periods on the vessel and on land, before sale in the markets. Saltfish is usually displayed and sold on ice box tops in a dedicated area in Honiara Central Market and can be stored overnight in Market-maintained ice boxes for a small fee. Vendors report quality checks by Government officials are rare, but they monitor fish quality themselves and reject fish that has been unsold for several days and is exhibiting a strong

deterioration in quality. Despite these quality issues, salt fish trade is important for food security particularly among lower socio-economic components of the Honiara community.⁴⁸

Solomon Islands opportunity summary

Issue	Status	Recommendation
Current policy on by-catch landings	Not specifically regulated	Policies should be put in place to mandate all licensed vessels to land all by-catch as well as seek other agreements to keep transshipment volumes high for food security considerations.
Future protein needs ⁴⁹	The urban populations are expected to grow by 79% by 2050 with severe food security implications.	There is a need to both increase by-catch volumes as well as ensure hygienic distribution.
Seafood preference	Mixed	There is high demand for by-catch from the lower income sector especially around Honiara. ⁵⁰
Concerns for local fisher livelihoods	Low	In the urban markets there is high demand for all fish.
Infrastructure needs for by-catch distribution	Cold storage and distribution needs to enable hygienic local distribution operations.	The current local distribution channels in Honiara are unofficial and would be difficult to channel private investment to. There is a need for government to provide facilities or attract private sector investments.
Alternative use of by-catch to support food security	No information	Given high demand, direct human use of by-catch should be prioritised over secondary products.

⁴⁸Tolvanen, S., Thomas, K. and Lewis, T. 2021. *Assessing the contribution of landings from in-port transshipment to food security in the Pacific*, FFA Report

⁴⁹ Ref: Study 5

⁵⁰ Tolvanen, S., Thomas, K. and Lewis, T. 2021. *Assessing the contribution of landings from in-port transshipment to food security in the Pacific*, FFA Report.

2.3.7 Tuvalu

There is no specific legislation relating to local landings from transshipping vessels (either requiring or prohibiting it) however any such landings could potentially not be compliant with customs and agricultural quarantine regulations. Consultations with Tuvalu Fisheries Department (TFD) and agents in Funafuti suggest that most fish received from transshipping vessels are not sold on the local market but are rather used for personal consumption among family members or as bait for artisanal fishing. The requirement for a license to sell fish and the close network of fishers supplying the local market are likely reasons preventing fish from transshipment being commercially traded in the community.⁵¹

There is a policy plan to increase the use of bycatch from transshipments to support local food security (not small /reject tuna) needs which is yet to be actioned. Currently, there are two fish markets in Funafuti in operation, the Fishermen of Funafuti Association (FOFA) market and the National Fishing Corporation of Tuvalu (NAFICOT). Discussions to formalize the handling of by-catch and reject tuna from transshipment through NAFICOT or FOFA took place before the COVID-19 pandemic. Both NAFICOT and FOFA offer processed fish products, mainly sun-dried and smoked fish. NAFICOT escalated its capacity in 2019, with the installation of new fin bins, freezers and a drying/smoking machine donated by Korea, as well as training for approximately 20 locals in processing techniques. However, due to limited transshipment activities since early 2020, plans to process bycatch have been temporarily placed on hold.⁵²

Tuvalu opportunity summary

Issue	Status	Recommendation
Current policy on by-catch landings	Not specifically regulated	Policy changes should be considered to mandate the landing of by-catch.
Future protein needs ⁵³	Small 3% population increase expected by 2050	Given potential climate induced changes to transshipment volumes and reef fish availability the food security situation on Funafuti needs to be monitored.
Seafood preference	Fresh fish	There is more demand for processed bycatch products than brined fish sales.
Concerns for local fisher livelihoods	Moderate	Local fishers role in supplying non-reef based protein should be prioritised (i.e. through a FAD program and provision of shore-based infrastructure).

⁵¹ Ref: Study 5

⁵² Ref: Study 5

⁵³ Ref: Study 5

Infrastructure needs for by-catch distribution	Some infrastructure in place but if volumes increased additional investments to support storage and distribution might be needed.	Local SMEs have potential to receive investment or enter into PPPs. ⁵⁴
Alternative use of by-catch to support food security	Fish waste is currently used as pig feed	Given by-catch volumes are at times high and can exceed local capacity the production of aquaculture or animal feed should be considered as a secondary product.

Table 1. Summary of priority policy recommendations per country

Country	Revise licensing condition to mandate by-catch landing	Update domestic regulations to allow by-catch landing	Prohibit at sea discards of all species in licensing conditions	Other
FSM	Consider	Consider for secondary products as a start	Consider	Policy changes need to be implemented in line with investments to secondary products or a strategy not to harm local fishers.
Kiribati	Already in place	Already in place	Priority action	Enforcement of existing regulations
Nauru	Consider	Consider	Consider	Nauru’s new port needs more information on the volumes transshipped and

⁵⁴ A Public-Private Partnership (PPP) is a partnership between the public sector and the private sector for the purpose of delivering a project or a service traditionally provided by the public sector.

Country	Revise licensing condition to mandate by-catch landing	Update domestic regulations to allow by-catch landing	Prohibit at sea discards of all species in licensing conditions	Other
				potential food security benefits as it becomes operational
Papua New Guinea	Priority action	Issue needs clear policy guidance	Priority action	Policy changes need to be accompanied by high level action plans to provide cross sector infrastructure support for distribution to Port Moresby.
RMI	Consider	Consider	Consider	Policy changes need to be implemented in-line with investments to support processing of secondary products or a strategy not to harm local fishers.
Solomon Islands	Priority action	Issue needs clear policy guidance	Priority action	SI needs to consider more overarching mechanisms to secure consistent and increasing supply of by-catch under the different climate scenarios given the predicted gap in protein supply. The viability of a PNA collective

Country	Revise licensing condition to mandate by-catch landing	Update domestic regulations to allow by-catch landing	Prohibit at sea discards of all species in licensing conditions	Other
				agreement to ensure transshipment volumes are maintained should be assessed.
Tuvalu	Consider	Issue needs clear policy guidance	Consider	n/a

3. Financial mechanisms recommended to support transshipments programs to increase the local availability of tuna

3.1 Recommendations from study 5

Study 5 identified four key areas for infrastructure improvements to ensure efficient delivery of by-catch from transshipment:

1. development of efficient collection systems – underpinned by large reliable vessels to go between the shore and transshipping vessels;
2. ensuring transportation networks on both land and sea provide support for the distribution of bycatch between the point of landing and sale;
3. establishing basic facilities at ports and markets for preparation, sale or storage of the fish – e.g. concrete spaces with access to water and waste disposal; and
4. providing support for private investment along the supply chain by improving access to finance and financial literacy, as well as reducing tax burdens to SMEs.

One of the most important messages that came out of the consultations with industry and other experts in study 5 was that bycatch is a low-value product with very little margin to justify large investments in its delivery or value-added processing. The best use of government resources would be to focus on facilitating a conducive environment to conduct business rather than direct intervention in the supply chain. The study also concluded that any public investments made in infrastructure should be for facilities that can be used and shared across sectors such as roads for general access, wharf facilities for multiple uses, cold storage and others. The following section discusses different investment mechanisms that can support the required infrastructure.

3.2 Estimating the costs associated with optimizing the availability of fish from transshipping operations for domestic food security

Local operators currently involved in by-catch distribution were approached for views on costs for different infrastructure needs. Unfortunately, any information obtained was inadequate to make a meaningful assessment. Even previous estimates made for investments such as the Honiara fish market

were not seen as accurate given the recent global inflation and changes in prices. As a result, it was not possible to prepare a detailed financial model for the required infrastructure (refer to Study 11).

Also, given that some of these infrastructure needs often take a long-time to materialize and might well fall outside the capacity of the RTP to implement (roads, wharves) more immediate decisions will be required to secure short to medium-term benefits of increased access to, and utilization of, tuna and by-catch transshipped from industrial-scale fishing to contribute to national food security. The use of by-catch for local micro canning, provide products that extend shelf life and do not compete with local fishers has been trialed with mixed results.⁵⁵ If this is not a feasible option and where the delivery of by-catch to urban populations is not possible, or the demand for direct by-catch use is low, there is a need to maximize the benefit of by-catch for other purposes such as fish meal, poultry or other animal feeds as explained in 2.2.1.

Future discussions with the participating countries in the RTP on their willingness to make the necessary policy changes as well as consider the potential diversification of the use of by-catch to fish and animal feeds and other products that support food security will be required. A detailed assessment of the infrastructure needs and costs will be based on the approach chosen. The investment needs will depend on whether the transshipped tuna and by-catch are prioritized for direct consumption, for fish/animal feed or other products depending on demand.

Following consideration of the above policy decisions, it is recommended that the RTP conduct a more detailed feasibility study of the infrastructure requirements to support sourcing tuna and by-catch from transshipment operations to contribute to addressing national food security needs . This assessment needs to be based on detailed information relating to:

- a. current infrastructure and its useability;
- b. volume projections and national protein needs;
- c. based on the above determine the size of collection vessels, size of fish markets, cold storage and solar capacity requirements, and/or
- d. the capacity needs of appropriately scaled fish processing facilities to produce fish and animal meal;
- e. SME landscape analysis and appropriate training and support to potential SMEs;

Engineering and fishery operations experts are also needed to assess the potential locations. Other external needs such as legal and rental requirements and specific construction requirements accounting for a range of potential climate change impacts will also be required. Following on from this and taking account of the findings, reflective tender documentation will need to be prepared for construction firms active in the region who can give up-to-date reliable estimates of the costs based on the exact parameters of the construction, the location and other operational details. Study 11 is preparing this for the Honiara fish market and could serve as a pilot for other countries/locations within the RTP.

As discussed earlier (3.1), many of the above investments are difficult for private investment in a traditional sense, given the low-value product, the high cost of infrastructure needs and the lack of replicable models of private sector leadership on the issue. However, there are still viable options for Public Private sector Partnership (PPP) approaches in engaging existing SMEs to be involved in the sector

⁵⁵ FFA 2019. *Small scale tuna canning in Palau strats next week*. Accessed in January 2024.
<https://tunapacific.ffa.int/2019/09/20/small-scale-tuna-canning-training-in-palau-starts-next-week/>

as well as options to encourage larger SMEs roles in the operations. The financing options for the different infrastructures are highlighted in more detail in 3.3. below.

3.3. Most practical and reliable sources of funding to optimise the domestic food security and sustainable livelihoods benefits from transshipping operation

Given the lack of detailed cost information on the required infrastructure needs this section provides an overall assessment of the types of investments the RTP can help facilitate. The options presented below involve long-term financial arrangements that will support infrastructure that will be utilized well beyond the life of the RTP.

Table 2. Summary of potential investment models per infrastructure need for by-catch distribution

Infrastructure requirement	Domestic public finance / international development finance	Development grant / blended finance	Traditional bank / private investment	Incentives to encourage SME involvement
Road	x			
Wharf and port infrastructure	x	x		
Collection vessel		x	x	x
Fish market with waste management and water	x	x		
Cold storage	x	x	x	x
Ice factory	x	x	x	x
Renewable energy	x	x	x	
Fish meal and other processing facilities		x	x	x
Trucks, ice boxes etc.		x	x	x

Infrastructure requirement	Domestic public finance / international development finance	Development grant / blended finance	Traditional bank / private investment	Incentives to encourage SME involvement
Waste Management	x	x	x	

3.3.1 Domestic public finance and/or international development finance

This finance stream can include national infrastructure budgets that are either financed from the regular national budget or through International Development Finance (IDF). IDF typically provides either grants or concessional loans and the usual lenders in the region are the World Bank (WB), Asian (or other regional) Development Banks as well as many bilateral financiers. The IDFs usually have long-term programs in the countries and regions they support and the investment needs are evaluated within those programs. IDF investments are required align with the UN Sustainable Development Goals (SDGs) as well as climate-related adaptation and mitigation targets as mandated by the Paris Agreement.

Roads, ports, renewable energy projects as well as cold chain infrastructure all fall within the usual scope of this kind of finance and can include national debt finance, grant components and blended finance (see below). Green electricity, climate-friendly cooling and cold chain investments are a priority for many of the IDFs, especially as the Covid-19 pandemic highlighted the global inequities in vaccine distribution due to the lack of sufficient cold chains to store and distribute vaccines in many parts of the world, including in the Pacific.⁵⁶

It is well within the scope of the RTP to engage the Development Banks in considering the broader climate adaptation and food security needs in the region and how the proposed infrastructure falls within these programs and the overall green/climate resilient infrastructure for the region. Combining sectors and generic country needs (wharves, roads) would also help reach the scale required for this kind of finance, provide benefits that go beyond the by-catch issues and assist with the necessary policy and regulatory environment and capacity building needed to support the longevity of these projects and investments.

3.3.2 Development grants or blended finance

As well as ‘the banks’ above there are many national and multilateral players involved in the development finance space with grant-based funding. Developed nations have committed to spending at least 1% of their GDP in assisting the least developed countries and these commitments are on the increase to cover the recent commitments to climate change-related loss and damage.⁵⁷

International development programs such as USAID, AUSAID, the EU and others are regular funders of different programs in the region that include long-term capacity building as well as infrastructure needs.

⁵⁶ UN FAO 2022. *Sustainable food cold chains*. Accessed November 2023. <https://www.fao.org/3/cc0923en/cc0923en.pdf>

⁵⁷ IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp

Again, early engagement of these programs by the RTP on the investment needs for transshipment by-catch distribution is needed to ensure sufficient time to include these aspects in their long-term programs. Also, other climate-specific funders and food security funds such as the UN International Fund for Agricultural Development (IFAD) may be able to consider contributing to the work of the RTP with additional grants or blended finance options.

Blended finance combines the power of development finance and private capital to reduce risks and increase opportunities for private investors and PPPs or bonds are the usual vehicle for this kind of investment. Development finance can include grant or non-grant components such as debt, equity or guarantees to attract additional private investments to the projects. Most of the proposed investments for by-catch landing and distribution infrastructure can fall within this type of finance, especially for SIDS where environmental and social outcomes are often focus areas of blended finance.⁵⁸

PPPs have had a bad reputation due to widespread criticism of the intrinsic weaknesses of the PPP model. This includes a lack of accountability of private companies to the people, leading to cost overruns that impose a burden on future generations. PPPs have also been used as a financial mechanism that hides expenditures off the public balance sheet. In the last decade there has been more effort to implement standards to ensure better performance of PPPs so that, among other objectives, they remain one of the key pathways for achieving the SDGs as part of the 2030 agenda. Some considerations for successful PPP approaches include:⁵⁹

- a. Careful consideration given to the structure and use of blended finance instruments;
- b. Sharing risks and rewards fairly;
- c. Meeting social and environmental standards;
- d. Ensuring “sustainable, accessible, affordable and resilient quality infrastructure”;
- e. Ensuring accountability mechanisms and transparency, including in public procurement frameworks and contracts ;
- f. Ensuring the participation of communities in decisions that will affect them;
- g. Ensuring effective management, accounting, and budgeting for contingent liabilities, and debt sustainability, and
- h. Alignment with national priorities and relevant principles of effective development cooperation.

In initiatives aimed at improving national food security, cold storage is often prioritized by governments as it has broad utility across a range of perishable foods beyond fisheries. In the case of many PICs, facilities could be shared with several operations including local small-scale fishers, farmers and SMEs interested in food processing. Innovative PPP approaches can help cover their upfront as well as ongoing costs. Electricity costs in many PICs are extremely high and solar or other renewable and affordable electricity investments need to be considered as part of the initial investments to ensure long-term operational efficiency. This kind of essential national infrastructure need is often financed by development banks

⁵⁸ GEF 2023. *Call for proposals*. Accessed in August 2023. <https://www.thegef.org/documents/second-call-proposals-gef-8-blended-finance-global-program>

⁵⁹ World Bank 2022. *A short history of PPPs*. Accessed in August 2023. <https://blogs.worldbank.org/ppps/short-history-ppps-development-good-bad-and-hopeful>

provided sufficient scale can be reached. Recently there has been a focus on cold storage infrastructure in PNG, which was funded by the World Bank for example.⁶⁰

3.3.3 Traditional bank or private investment

There is a wide consensus within the industry that it is challenging to attract private investment for low value by-catch storage, processing and distribution initiatives. Given the projected large expenses involved in most of the infrastructure needs and the lack of proven finance models, it is unlikely that a local bank or a private investment fund, even an impact fund that prioritize environmental and social outcomes as well as economic returns, would involve in a project without additional de-risking or approaches such as those explained above.

If investments such as renewable energy, cold storage and associated infrastructure are treated as more generic investments, within a broader finance model that goes beyond by-catch, the potential for this type of finance will be improved. A proven private sector operator, with sufficient track record of financial management, who can manage the investment and the operations would improve the prospects for success of such an initiative. Some of the smaller investments such as skiffs, ice boxes and working capital might also be possible to finance through local banks or impact-facing funds (either private or public) if a capable SME is involved.

As with the recommendations for the FAD part of this study, there is a need to support local financial innovation. The RTP should consider building the awareness and capacity of local private institutions in “blue lending” and local bond issuance to attract local private investors. Private investors in PICs are risk-averse and not familiar with ocean finance.⁶¹ An option for some countries would be to raise a local bond to cover a range of food security, health and sustainable livelihoods components. The recent Fiji green bond provides an example.⁶² Most PICs have sovereign wealth funds that could be interested in investing in food security and fisheries, provided there is or would be government legislation, guarantees and possibly insurance. Early on in RTP, mapping of local lending frameworks should be undertaken to assess their ability and interest to contribute to transshipment by-catch program finance and long-term needs. Expert support may need to be put this in place to help familiarise the parties with the blue economy lending needs and opportunities in providing new finance vehicles for this sector.

3.4 Incentive options for small and medium enterprises (SME) and PPP to distribute tuna from transshipping operations to urban and peri-urban communities.

The definition of an SME varies between countries and is generally more linked to the economic and business environment of the specific country, rather than a strictly defined parameter (such as revenue or number of employees).⁶³ Hence an SME in Tuvalu and Australia might look quite different. In the

⁶⁰ World Bank 2019. Recovery amid uncertainty. Accessed August 2023.

<https://documents1.worldbank.org/curated/en/534921562647834569/pdf/Papua-New-Guinea-Economic-Update-Recovery-Amid-Uncertainty.pdf>

⁶¹ UNDP 2022. Demystifying green bonds in the Pacific. Accessed November 2023.

<https://www.undp.org/pacific/publications/demystifying-green-and-blue-bonds-pacific-region>

⁶² World Bank 2017. *Fiji Issues First Developing Country Green Bond, Raising \$50 Million for Climate Resilience*. Accessed in August 2023. <https://www.worldbank.org/en/news/press-release/2017/10/17/fiji-issues-first-developing-country-green-bond-raising-50-million-for-climate-resilienc>

⁶³ UNESCAP, SMEs in the Asia Pacific. Accessed in August 2023. <https://www.unescap.org/sites/default/files/7%20-%201.%20SMEs%20IN%20ASIA%20AND%20THE%20PACIFIC.pdf>

context of the by-catch collection and distribution in the transshipment hubs, an SME can be a small business operation that is either involved in a part of the supply chain for the by-catch such as delivery and distribution to the market or is responsible for the full supply chain from the pick-up of by-catch to processing and distribution. At present many of the unofficial players involved in the distribution of by-catch are micro-operators of just a few people, often from the same family unit, collaborating, rather than an official registered business that would be labelled as an SME.

SME development is an important area for many emerging and developing economies due to the important role they play in employment and economic activities. Although not specific to the SME sector, the WB's annual Doing Business rankings comprise perhaps the most comprehensive survey of the differing business conditions globally in 190 countries. Briefly, the Doing Business exercise seeks to quantify and rate the ease of doing business in a country based on 10 components, comprising: (a) starting a business; (b) dealing with construction permits; (c) employing workers; (d) registering property; (e) getting credit; (f) protecting investors; (g) paying taxes; (h) trading across borders; (i) enforcing contracts; and (j) closing a business. The highest-ranking PIC in 2019 was Fiji at 102 (out of 190 countries assessed), followed by PNG (120) Solomon Islands (136), RMI (153), FSM (158) and Kiribati (164). Tuvalu was not assessed.⁶⁴ Together with the acknowledged high costs of operations, such an index confirms the region as a challenging place to start and successfully operate a business.

Locally-based support is also available through initiatives such as the Pacific Private Sector Development Initiative (PSDI).⁶⁵ PSDI is a regional technical assistance program undertaken in partnership with the Government of Australia, the Government of New Zealand, and the Asian Development Bank. Since 2007, PSDI has worked to alleviate poverty and promote economic growth in the Pacific region through reforms that reduce the constraints to doing business and promote inclusive growth, entrepreneurship, and new business models.

Smaller investment needs to support engagement in by-catch supply chains, such as skiffs, ice bins, ice machines and associated small-scale equipment are generally within the investment capability of SMEs. Some larger companies might also be able to receive investment for cold storage and transport vessels, if they have diversified income streams. Given the facilitation that large and potentially unpredictable volumes of by-catch might require such as large additional cold storage, this type of investment need may fall outside of the capacity of most local SMEs and finance available for them, unless they are already involved in other activities that provide them income complimentary to the by-catch. Another option to finance the cold storage use is to rent it out for other users during times when by-catch volumes are low.

A business decision by an existing SME to get involved in by-catch collection and distribution will require additional risks associated with expanding their traditional operations and core business. Examples include RMI where two companies made the necessary investments to process fish meal. In Tuvalu, development aid was successfully applied to support the diversification of market vendors to utilize by-catch as an additional activity to their established fish processing and selling operations. Specialised SME platforms such as the ADB Blueimpact and the EU BlueInvest⁶⁶ provide training and facilitate the

⁶⁴ World Bank 2019, Ease of doing business rankings. Accessed August 2023.

<https://archive.doingbusiness.org/en/rankings>

⁶⁵ PSDI 2017, *Financing growth*, Accessed January 2024. <https://www.pacificpsdi.org/what-we-do/financing-growth/>

⁶⁶European Commission 2019. Blue Invest. Accessed November 2023. https://oceans-and-fisheries.ec.europa.eu/ocean/blue-economy/blueinvest_en

aggregation of small projects into a pipeline of investable projects at scale able to attract investors interested in aligning their investment with global goals.

In countries where unofficial collection and distribution of by-catch is common, distributors often lack adequate cold chain facilities. This leads to hygiene issues and spoilage particularly during periods of high volume underscoring the need to develop models of operations that are safe, hygienic and able to operate at sufficient scale. Additional support is required for these SMEs or micro-enterprises in areas such as hygiene training, financial literacy and other capacities in order to attract investment by banks or other local lenders. This is likely to require a government intervention and a support program that will identify and bring these players up to the required level.

Aside from government-operated collection and distribution in Kiribati and the Solomon Islands, this Study has not revealed any companies or SMEs that are commercially active in by-catch utilization/distribution. The only examples in the region are the local companies in RMI that expanded their operations to fishmeal processing and the seafood market vendors in Tuvalu. There are likely some additional players in PNG but their operations have not been adequately documented.

Given the well-documented challenges of business (and capacity) development in the region, it would be preferable to try and engage established local SMEs with a track record of good financial management and operational and managerial capacity to expand their operations to include by-catch collection, distribution and sale. Incentives that could be considered to support such involvement include tax exemptions, donated equipment to expand businesses as well as other grants and partially subsidized development programs. It is recommended that a review of the SME sector in each participating country be conducted early in the RTP to begin assessing gaps and mapping opportunities.

In some countries where domestic fleets already operate and land their catch in local ports and facilities that are in the vicinity of transshipment locations, incentives could be explored also to see how these companies could expand their operations to handle by-catch from the foreign purse seine fleet. This would take advantage of existing skills, potential markets and distribution chains and established infrastructure that could be shared and expanded upon. The incentives to engage such established operators could involve discounts for port and licensing fees, tax breaks and preferential access.

Aside from providing direct grants for equipment and working capital, SMEs may also be influenced by policies that help to de-risk their operations, especially in new ventures where viability and long-term finance plans need to be proven while markets are developed. Fixed-term tax breaks or discounts can be attractive. These however may not be sufficient, especially if the operation is evolving and requires support to grow. A commitment from governments or other development partners and financiers to the long-term capacity building of SME's and their success is equally important. Early attention should be given to how the SME can be supported in this regard. The PPP model offers potential in this respect particularly if the private sector partner is well established and demonstrates the required competencies to improve the potential success of the venture.

There are many different SME and start-up support ecosystems around the world⁶⁷ and it is a priority for many governments to foster such support through technology, regulations, capacity building, innovation and finance. As a remote region the Pacific, with a small business environment, lags in offering these kinds

⁶⁷ ADB 2021. *Blue Sea Finance Hub*, Accessed in November 2023. <https://www.adb.org/what-we-do/themes/environment/blueseas>

of support. Learning and capacity building initiatives that provide opportunities for young entrepreneurs or principals of established businesses to study relevant programs and initiatives in other countries to gain experience and network offer potential benefits. There are ongoing calls for accelerators and innovation support for SMEs and start-ups. For example, the latest UN call is specifically focused on businesses based in the SIDs and LDCs.⁶⁸ There are also other programs that support struggling businesses such as the Australian Business Volunteers which sends experienced professionals (business management, financial management, accounting, manufacturing, supply chain development, advertising and sales), often retired on overseas volunteer postings.

3.5 Evaluation of the potential for the private sector to benefit from the investments made by GCF to adapt transshipping operations to increase access to bycatch for urban communities.

Due to the lack of accurate cost information which is necessary to develop detailed finance and investment models, it is not possible to evaluate in detail the potential benefit of the GCF investment made. This will need to be modeled in more detail during the GCF Programme implementation once the steps suggested in Section 3.2 are actioned accurate cost and financing options have been assessed and the extent of the impact created can be measured.

Table 3 below summarises the potential long-term benefits for the private sector per investment category and the likelihood of cost-sharing possibilities.

Table 3: Summary of potential benefit for industry from infrastructure investments

Infrastructure requirement	Potential for industry to benefit	Potential cost sharing arrangement
Road	Can benefit industries across different sectors	Unlikely, as road infrastructure is seen as government responsibility
Wharves and port infrastructure	Can benefit industries across different sectors	Unlikely, as port infrastructure is seen as government responsibility or limited to specific equipment related to their special operations.
Collection vessel	Can benefit other seafood companies if a joint operation or expansion of an existing fishing related SME	Potential
Fish market with waste	Can provide market for	Unlikely unless part of a large

⁶⁸ UNFCCC 2018, *Loss and Damage – online guide*. Accessed August 2023.
https://unfccc.int/sites/default/files/resource/Online_guide_on_loss_and_damage-May_2018.pdf

Infrastructure requirement	Potential for industry to benefit	Potential cost sharing arrangement
management and water	small-scale fishers and value added products by local micro enterprises	corporate CSR
Cold storage	Can benefit industries across different sectors	Potential
Ice factory	Can benefit industries across different sectors	Potential
Renewable energy	Can benefit industries across different sectors	Unlikely, as energy infrastructure is seen as government responsibility
Fish meal processing facility	Can benefit local processors that may also have fish waste	Potential
Trucks, ice boxes etc.	Can benefit other seafood companies if a joint operation or expansion of an existing fishing related SME	Potential
Waste management	Can benefit industries across sectors	Potential

3.6 Summary recommendations for supporting financial mechanisms

Investment in the required by-catch collection, storage and distribution infrastructure is difficult to attract and will require country-specific approaches based on the local demand and other factors as explained in 3.2. Each RTP country will consider the appropriate strategy to pursue based on policy decisions and changes around the potential development of a ‘protein hierarchy’ strategy and the associated detailed assessment of the infrastructure needs and costs. The investment needs will depend on whether the transshipped tuna and by-catch is prioritized for direct consumption or other uses such as fish meal for local agriculture and aquaculture depending on supply/demand and the need to protect local fishers and their livelihoods. Given the low level of demand in some of the high-volume locations, the secondary uses of by-catch are an important consideration for the overall increased use of tuna resources to ensure no by-catch is wasted and that it can contribute to increased food security.

A combination of port infrastructure and a long-term supporting regulatory and policy environment will need to be created (summarised in Table 1) to incentivize by-catch offloading in PIC ports, attract international investment in the required infrastructure and facilitate local investment and SMEs in distribution, storage and processing. Governments need to consider prioritizing the use of tuna by-catch

as an important source of food security and potential for local economic opportunities especially if direct human consumption in urban centers is going to be logistically and economically possible. Proven finance models for the sector and required investments are largely lacking and will require policy-driven direction. It will be important to co-invest in infrastructure that will benefit other sectors as well and provide broader food security-based benefits for the country. The secondary uses of by-catch, such as fish or poultry meal, are likely going to be easier to put into place and attract SME involvement in the short-term in the countries where there is also limited demand. The secondary uses are also more likely to attract private investment as existing business models exist and the upfront costs are less than those needed for direct human use of by-catch.

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Appendix 1. List of people consulted on this study

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Tuna industry players who did not want to be referenced	