

Concept Note

Project/Programme Title: Adapting tuna-dependent Pacific Island communities and economies to climate change

Countries: Cook Islands, Federated States of Micronesia, Fiji, Kiribati*, Marshall Islands, Niue, Nauru, Palau, Papua New Guinea, Samoa, Solomon Islands*, Tonga, Tuvalu*, Vanuatu

(* = least developed country)

National Designated
Authorities:

Cook Islands (Climate Change, Cook Islands Division of the Office of the Prime Minister); **Federated States of Micronesia** (Department of Finance and Administration); **Fiji** (Ministry of Economy), **Kiribati** (Ministry of Finance and Economic Development); **Marshall Islands** (Office of Environmental Planning and Policy Coordination); **Nauru** (Department of Foreign Affairs and Trade); **Niue** (Ministry of Finance); **Palau** (Office of the President); **Papua New Guinea** (Climate Change and Development Authority); **Samoa** (Ministry of Finance); **Solomon Islands** (Ministry of Environment, Climate Change, Disaster Management and Meteorology); **Tonga** (Ministry for Meteorology, Energy, Information, Disaster Management, Environment, Climate Change and Communications); **Tuvalu** (Government of Tuvalu); **Vanuatu** (Ministry of Climate Change, Change Adaptation, Meteorology, Geo-Hazards, Environment, Energy and Disaster Management)



GREEN
CLIMATE
FUND

Accredited Entity (AE): Conservation International

Date of first submission/
version number: [2019-06-07] [V.1]

Date of current submission/
version number: [2021-05-27] [V.3]

Notes

- The maximum number of pages should **not exceed 12 pages**, excluding annexes. Proposals exceeding the prescribed length will not be assessed within the indicative service standard time of 30 days.
- As per the Information Disclosure Policy, the concept note, and additional documents provided to the Secretariat can be disclosed unless marked by the Accredited Entity(ies) (or NDAs) as confidential.
- The relevant National Designated Authority(ies) will be informed by the Secretariat of the concept note upon receipt.
- NDA can also submit the concept note directly with or without an identified accredited entity at this stage. In this case, they can leave blank the section related to the accredited entity. The Secretariat will inform the accredited entity(ies) nominated by the NDA, if any.
- Accredited Entities and/or NDAs are encouraged to submit a Concept Note before making a request for project preparation support from the Project Preparation Facility (PPF).
- Further information on GCF concept note preparation can be found on GCF website [Funding Projects Fine Print](#).

A. Project/Programme Summary (max. 1 page)			
A.1. Project or programme	<input type="checkbox"/> Project <input checked="" type="checkbox"/> Programme	A.2. Public or private sector	<input checked="" type="checkbox"/> Public sector <input type="checkbox"/> Private sector
A.3. Is the CN submitted in response to an RFP?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If yes, specify the RFP: _____	A.4. Confidentiality¹	<input type="checkbox"/> Confidential <input checked="" type="checkbox"/> Not confidential
A.5. Indicate the result areas for the project/programme	<p>Mitigation: Reduced emissions from:</p> <input type="checkbox"/> Energy access and power generation <input type="checkbox"/> Low emission transport <input type="checkbox"/> Buildings, cities and industries and appliances <input type="checkbox"/> Forestry and land use <p>Adaptation: Increased resilience of:</p> <input checked="" type="checkbox"/> Most vulnerable people and communities <input checked="" type="checkbox"/> Health and well-being, and food and water security <input type="checkbox"/> Infrastructure and built environment <input checked="" type="checkbox"/> Ecosystem and ecosystem services		
A.6. Estimated mitigation impact (tCO₂e over lifespan)	N/A	A.7. Estimated adaptation impact (number of direct beneficiaries and % of population)	4 million people, i.e., 37% of the estimated total population of 10,800,000 in the 14 countries in 2020
A.8. Indicative total project cost (GCF + co-finance)	Amount: USD 120,945,000	A.9. Indicative GCF funding requested	Amount: USD 70,245,000
A.10. Mark the type of financial instrument requested for the GCF funding	<input checked="" type="checkbox"/> Grant <input type="checkbox"/> Reimbursable grant <input type="checkbox"/> Guarantees <input type="checkbox"/> Equity <input type="checkbox"/> Subordinated loan <input type="checkbox"/> Senior Loan <input type="checkbox"/> Other: specify _____		
A.11. Estimated duration of project/ programme:	7 years	A.12. Estimated project/ Programme lifespan	At least 25 years
A.13. Is funding from the Project Preparation Facility requested?²	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Other support received <input type="checkbox"/> If so, by who: _____	A.14. ESS category³	<input type="checkbox"/> A or I-1 <input checked="" type="checkbox"/> B or I-2 <input type="checkbox"/> C or I-3
A.15. Is the CN aligned with your accreditation standard?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	A.16. Has the CN been shared with the NDA?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
A.17. AMA signed (if submitted by AE)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> If no, specify the status of AMA negotiations and expected date of signing: _____	A.18. Is the CN included in the Entity Work Programme?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
A.19. Project/Programme rationale, objectives and approach of programme/project (max 100 words)	<p>Brief summary of the problem statement and climate rationale, objective and selected implementation approach, including the executing entity(ies) and other implementing partners.</p> <p>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 fishing and threatening the food security of more than four million people that live along the coasts of the programme's targeted 14 Pacific Island countries. In parallel to the threat to the food security of highly</p>		

¹ Concept notes (or sections of) not marked as confidential may be published in accordance with the Information Disclosure Policy ([Decision B.12/35](#)) and the Review of the Initial Proposal Approval Process ([Decision B.17/18](#)).

² See [here](#) for access to project preparation support

³ Refer to the Fund's environmental and social safeguards ([Decision B.07/02](#))

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. This programme will: 1) increase supply of tuna for domestic consumption as an adaption to degradation of coral reefs and the resulting food insecurity for vulnerable populations; and 2) usher in the reforms needed to minimise the risks for citizens of countries with economies that are vulnerable to climate-driven redistribution of tuna. The project will be implemented in close coordination with the 14 governments by Conservation International (Accredited Entity and Executing Entity), the Pacific Community (SPC) (Executing Entity) and the Pacific Islands Forum Fisheries Agency (FFA), United Nations Food and Agriculture Organisation (FAO) and the Secretariat of the Pacific Environmental Programme (SPREP) (Implementing Partners).

B. Project/Programme Information (max. 8 pages)

B.1. Context and baseline (max. 2 pages)

Describe the climate vulnerabilities and impacts, GHG emissions profile, and mitigation and adaptation needs that the prospective intervention is envisaged to address.

More than four million people, and the economies of nine countries, in the Pacific Islands region face severe risks due to the impacts of climate change on fisheries. These impacts are expected to occur in two major forms. The first is through the degradation of coral reefs, which provide most of the animal-based protein required for domestic food security across the region. The second major impact is on the redistribution of tuna supporting the industrial fisheries that many Pacific Island countries depend on heavily for revenue (from licensing fees) to fund basic services for their citizens.

The profound effects that global greenhouse gas (GHG) emissions are having on coral reef fish and tuna in the Pacific Island region are described in the IPCC Fifth Assessment Report [1], IPCC Special Report on 1.5°C [2] and the IPCC Special Report on the Oceans and Cryosphere [3], and in even more detail in the comprehensive assessments of the vulnerability of Pacific Island fisheries to climate change by the Pacific Community (SPC) [4] and FAO [5]. In brief, ocean warming is causing more frequent coral bleaching, and ocean acidification is slowing the growth of corals, resulting in less structurally complex coral reef habitats. By 2050, live coral cover is expected to be reduced by 50–75% under the RCP8.5 emissions scenario. The degraded coral reefs will support fewer fish. The growth, reproduction and survival of coral reef fish and other coastal fish species are also expected to be directly affected by ocean warming, and in some cases ocean acidification. Taken together, these impacts are highly likely to decrease production of coral reef fish in the Pacific Island region by 20–50% by 2050 under RCP8.5.

Ocean warming is also affecting the distribution of the region's rich tuna resources. In the western and central Pacific Ocean, the abundant skipjack tuna is caught most easily at the convergence of the two tropical ecological provinces – the western Pacific warm pool and the Pacific equatorial divergence. This convergence zone is already known to shift by up to 4,000 km due to El Niño Southern Oscillation (ENSO) events and is projected to move further to the east as the warm pool expands with increasing sea surface temperature. Preliminary modelling confirms that tuna in equatorial areas are also highly likely to shift progressively to the east as the ocean continues to warm, and to a lesser extent into subtropical waters. The resulting redistribution of tuna resources is predicted to reduce the average annual combined tuna catch from the exclusive economic zones (EEZs) of tuna-dependent Pacific Island countries in equatorial waters by 20% (range 10%–30%) by 2050 under RCP8.5 compared to the annual average catch from 2009–2018 [6].

Food security impacts

The implications for the food security of Pacific Island people are profound. Across the region, annual national fish consumption per capita ranges from 20–110 kg (Figure 1), i.e., up to five times the global average, and fish traditionally caught from coral reefs by small-scale fisheries provide 50–90% of dietary animal protein for coastal communities [7]. By 2035, population growth and the negative effects of climate change on coral reef fish production will create demand for an additional 75,000 tonnes of fish per year for good nutrition of coastal and urban communities. The rich tuna resources of the region are the most practical choice for filling this gap in fish supply [8] because, even though tuna are projected to migrate eastward, far more tuna than are needed for domestic food security will remain in national waters. Furthermore, there are few if any alternative sources of high-quality animal protein due to the limited potential for agriculture, horticulture, animal husbandry and aquaculture in many of the island nations. The region's tuna resources are not overfished [9] due to exemplary management by Pacific Island countries, and no problems are anticipated in using tuna to provide most of the additional 75,000 tonnes of fish needed for local food security. Indeed, only 6% of the total annual tuna catch from the Pacific Island region of ~1.25 million tonnes will be needed to fill the gap in fish supply by 2035 [8]. However, because tuna usually occur some distance from the coast, communities will need additional support to catch them. To make tuna a cornerstone of national food systems, urgent action is required to i) empower coastal communities to catch more tuna efficiently and safely; and ii) ensure that the supply of tuna for urban communities, delivered by industrial fishing vessels, is not disrupted as fleets fish and tranship their catch further to the east.

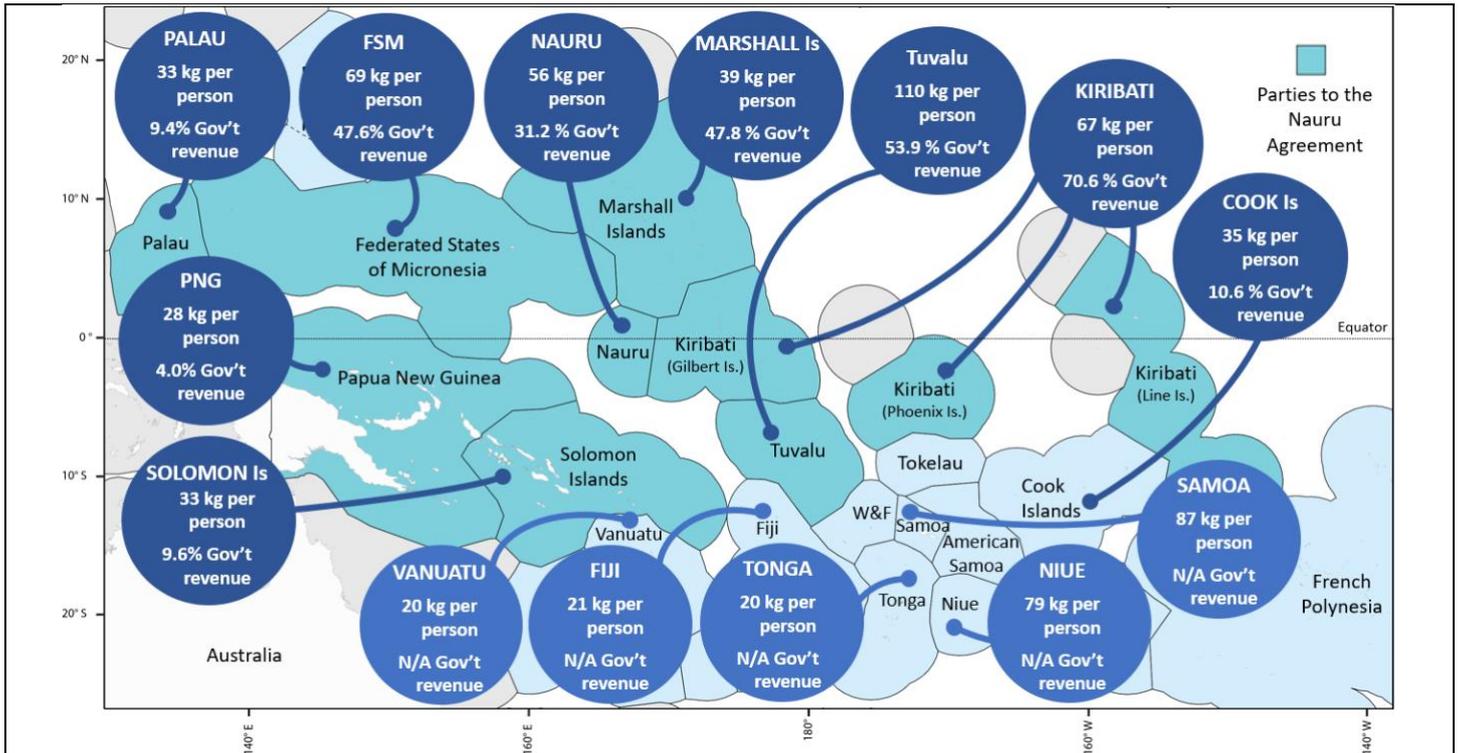


Figure 1. Annual average national fish consumption per capita (kg), and the average percentage contribution of tuna-fishing access fees to (non-aid) government revenue (2015–2018), in the 14 Pacific Island countries participating in the regional tuna programme (source: refs 6 and 7).

Economic impacts

Pacific Island countries have already done much to sustain the economic benefits they receive from tuna. Regrettably, climate change poses a serious threat to this notable achievement. In brief, the tuna-dependent Pacific Island countries have established a fisheries management system to deal with the effects of ENSO and climate change on the distribution of tuna within their combined EEZs. This mechanism – the Parties to the Nauru Agreement (PNA) ‘Vessel Day Scheme’ (VDS) – enables the eight participating countries (Federated States of Micronesia, Kiribati, Marshall Islands, Nauru, Palau, Papua New Guinea, Solomon Islands and Tuvalu) to share the economic benefits from tuna resources equitably, regardless of where the tuna are caught within their combined jurisdictions. The VDS is widely recognised as a world-leading, climate-smart fisheries management framework [10]. However, the VDS is currently unable to secure all the present-day benefits that PNA members receive from tuna as the fish move progressively from their combined EEZs into high-seas areas [11], leaving these countries highly vulnerable [12].

Climate-driven redistribution of tuna threatens to undermine the economies of the PNA member countries and Cook Islands, which obtain an average of 32% (range = 4–70%) of their total (non-aid) government revenue from tuna-fishing access fees (Figure 1) [13]. By 2050 under RCP8.5, the redistribution of tuna is projected to reduce the total fishing access fees for these nine countries by an average of ~\$90 million (range \$40–\$140 million) per year at today’s prices [6]. For several of these countries, the projected loss of fishing access fees is estimated to reduce total (non-aid) government revenue by 6–13% per year (range 2–9% to 11–18%) [6]. This significant reduction in government finance will have direct impacts on vulnerable populations in these countries, with fewer resources available for health, education, disaster preparedness and post-disaster recovery. Tuna redistribution could also affect employment across the region, where tuna fishing and processing has created ~25,000 jobs [13].

The priority adaptation for the tuna-dependent economies involves empowering them to negotiate for the right to retain access to the tuna resources that have historically occurred within their combined EEZs [11]. For the ‘subtropical’ countries (Fiji, Niue, Samoa, Tonga and Vanuatu), preliminary modelling indicates that the more modest tuna resources that occur in their EEZs could increase [14]. For these economies, adaptations centre on capitalising on any significant opportunities. To implement effective adaptations for both categories of Pacific Island economies, more reliable information on the timing and extent of possible tuna redistribution is essential.

In summary, the 14 Pacific Island countries participating in the programme have an extraordinary dependence on coral reef fish for food security and on tuna for economic development. The vital socio-economic benefits derived from these natural resources are at severe risk from climate change. Ocean warming and acidification are degrading the coral reefs that have traditionally provided most of the fish for coastal communities and climate-driven redistribution of tuna from the EEZs of nine Pacific Island countries to high-seas areas will reduce their government revenue significantly.

Please indicate how the project fits in with the national priorities and ownership of the concept. Is the project/programme directly contributing to INDCs/NDCs or national climate strategies or other plans such as NAMAs, NAPs or equivalent? If so, describe which priorities identified in these documents the project is aiming to address and/or improve.

Given the extensive social and economic dependence of Pacific Island countries on tuna (Annex 1), this programme is designed to be both regional and national in scope. The programme is of regional significance because tuna are migratory fish species shared by Pacific Island countries. Therefore, reliable information is needed on how tuna resources will respond to climate change and move across national jurisdictions, and from EEZs to high-sea areas (international waters). It is also relevant at the national level because adaptations to increase access to tuna for food security need to be customised for each country, due to varying food security contexts, and the wide differences in population size and location of Pacific Island nations (Annex 2).

The programme supports the following goals of the *Framework for Resilient Development in the Pacific: An Integrated Approach to Address Climate Change and Disaster Risk Management* (FRDP) [15], endorsed by Pacific Island Leaders: i) 'Strengthened adaptation and risk reduction to enhance resilience to climate change, including managing risks caused by climate change within social and economic development planning processes'; and ii) 'Strengthened preparedness, response and recovery to natural disasters caused by climate change'.

The programme will also build resilience to climate change by supporting the following important management frameworks, strategies and resolutions for the fisheries sector in the region:

- Western and Central Pacific Fisheries Commission (WCPFC) *Resolution on Aspirations of Small Island Developing States and Territories* (Resolution 2008-01) [16]
- *Regional Roadmap for Sustainable Pacific Fisheries* [17] designed to improve sustainability of tuna resources, add value to tuna catches, increase employment, and provide better access to tuna for food security, as well as building resilience of coastal habitats (by progressively shifting fishing effort from coral reefs to tuna);
- *A New Song for Coastal Fisheries – Pathways for Change* [18], an innovative regional approach to maintain the benefits of small-scale fisheries in the face of declining coastal ecosystems and associated fish stocks.
- The Parties to the Nauru Agreement (PNA) *Vessel Day Scheme* that supplies 95% of tuna caught in the region.

In addition, the programme will assist many Pacific Island countries to implement their Nationally Determined Contributions (NDCs) because 10 of the 14 participating countries have included the need for adaptations to the effects of climate change on the ocean and coastal marine habitats in their NDCs [19].

Describe the main root causes and barriers (social, gender, fiscal, regulatory, technological, financial, ecological, institutional, etc.) that need to be addressed.

The barriers to be addressed by this regional project fall into two categories – those that are limiting increased access to tuna for the food security of coastal and urban communities; and those that prevent governments from understanding and responding to the implications of climate-driven tuna redistribution for their economies.

Barriers to use of tuna for food security: Coastal communities have not been able to access sufficient tuna to offset the effects that climate change-induced coral reef degradation, and population growth, are having on per capita fish supply for a variety of reasons. First, many Pacific Island governments do not have sufficient resources and capacity to scale-up the use of the nearshore fish aggregating devices (FADs), recommended by the Pacific Community (SPC) (see Annex 3), designed to help coastal communities catch tuna and other types of pelagic fish (including smaller species not currently fished). Specific barriers include lack of resources to: institutionalise 'National FAD Programmes'; provide training in safe and effective FAD-fishing methods; ensure that vessels used by small-scale fishers to fish around FADs are fit for purpose; mainstream disaster preparedness and recovery plans for small-scale fishing communities; cyclone-proof national FAD systems; and train communities without refrigeration in simple post-harvest methods (e.g., drying and smoking) to increase the storage life of tuna caught around FADs. Second, despite existing regulations mandating that transshipment of tuna catches caught by industrial purse-seine fleets must occur in Pacific Island ports, many governments have not been able to invest in supply chains to deliver tuna from transshipping operations to rapidly-growing urban communities, due to uncertainty about the locations of future hubs of fishing activity. Patterns of transshipment in regional ports are already affected by ENSO and will be influenced further by climate change. Unless reliable information on the locations of future fishing hubs is available it will not be possible to identify the investments in market and supply-chain facilities needed to distribute tuna to urban communities effectively. Third, there is a lack of awareness among both coastal and urban communities about the imminent climate-change induced shortage of coral reef fish, and the need to diversify fish consumption to include much more tuna in their diets to ensure food security.

Barriers to national economic security: The governments of tuna-dependent Pacific Island countries are acutely aware of the implications of climate-driven distribution of tuna from their EEZs to high-seas areas for their economies [11]. However, there is a fundamental barrier preventing adaptation to the economic impacts of tuna redistribution, i.e., inadequate information for governments about the timing and extent of tuna movements. This lack of information limits the ability of Pacific Island countries to maintain their jurisdiction over the historical levels of tuna catch taken in their

waters. For example, the existing fishing restrictions designed to constrain operation of purse-seine vessels in high-seas areas could be challenged by nations from outside the region once a greater proportion of tuna occur in international waters. To ensure that the effects of climate change are increasingly integrated into regional tuna management arrangements, the Pacific Islands Forum Fisheries Agency (FFA) succeeded in having a Climate Change Resolution adopted by the Western and Central Pacific Fisheries Commission (WCPFC) in 2019 (Annex 4). However, measures to secure the benefits of tuna for Pacific Island countries under a changing climate remain to be identified and implemented. For example, obtaining the necessary international agreements in the relevant fora, including through the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, will only be possible with improved modelling and monitoring of tuna stocks. In particular, negotiating continued rights for Pacific Island countries to the tuna that have been driven from their EEZs to the high seas by climate change will require more accurate information on the timing and extent of tuna redistribution. In the absence of a system to provide more reliable forecasts of tuna redistribution and inform appropriate adaptations, a climate justice issue will arise. Tuna-dependent Pacific Island countries that have produced negligible GHG emissions and have few other options to support their national economies will lose vital government revenue, resulting in an inability to provide the basic services needed by their citizens to adapt to climate change.

The subtropical Pacific Island countries are also expected to benefit from development of the reliable information system described above. In particular, it will enable subtropical countries where preliminary modelling indicates that abundance of tuna could increase [14] to evaluate adaptations to capitalise on opportunities, e.g., increased industrial fishing and/or tuna processing.

To provide the reliable information needed to predict the redistribution of tuna with confidence for use in management decisions, the key weaknesses within existing modelling approaches need to be addressed. Essential improvements to models include: identifying responses of tuna resources to climate change at higher resolutions (this will require integration of information on tuna connectivity, tuna stock structures and meso-scale oceanography); improved assessment of the effects of climate change on the food webs that support tuna resources; and incorporating ocean forcings for all GHG emission scenarios.

Further details of barriers preventing adaptations to secure the necessary contributions of tuna to food security and economic development are summarised in Annex 5.

B.2. Project/Programme description (max. 3 pages)

Describe the expected set of components/outputs and subcomponents/activities to address the above barriers identified that will lead to the expected outcomes.

The programme will remove the main barriers to improve the food security of four million people and stabilise the economies of nine countries as illustrated below, and described in detail in the following text.

<p>Climate hazards to 14 developing Pacific Island countries</p>	<p>Increase in ocean warming and acidification from climate change decreases the productivity of coral reef fisheries threatening the food security of coastal communities.</p> <p>Ocean warming caused by climate change will drive tuna out of the EEZs of nine countries, depriving them of significant government revenue from tuna licensing by 2050.</p>
<p>Programme components to remove barriers and address the climate problem</p>	<p><u>Component A:</u> Greater use of fish aggregation devices (FADs) for communities to catch tuna, and access to bycatch for urban populations, will provide food security.</p> <p><u>Component B:</u> Development of an advanced warning system to model where climate change will drive tuna stocks, will empower countries to make a legal claim to continue to regulate tuna fisheries in high-seas areas.</p>
<p>Beneficiaries</p>	<p><u>Component A:</u> Four million people will have access to enough tuna and bycatch for good nutrition. Coral reef ecosystems will be more resilient.</p> <p><u>Component B:</u> Nine countries will continue to harness potential fishing licence revenue to fund schools, hospitals, roads and water supplies.</p>



Component A. Adaptations to harness tuna for food security of Pacific Island communities as coral reefs are degraded by climate change

This component addresses the need to improve food security of vulnerable communities by increasing access to tuna through empowering small-scale fishers to progressively transfer their fishing effort from coral reefs to tuna; and securing better access to tuna for rapidly-growing urban communities from industrial fishing operations. Importantly, these interventions will also ensure that coastal communities are equipped with the training and technology needed to fish around FADs safely and effectively; build the capacity of national fisheries administrations and coastal communities to prepare for and respond to climate-related natural disasters; and support fishers and communities to access local markets and add value to catches. The specific adaptation activities to be implemented in Component A are summarised below (the organisation/s with the main responsibility for executing these activities are shown in brackets).

- A1. Strengthen management of National FAD Programmes to support transfer of fishing effort from coral reefs degraded by climate change to tuna by making FADs part of the national infrastructure for food security. This major activity has many inter-related sub-activities, which are listed separately below.
- (i) Establishment of specialised sections within each national fisheries agency to design and implement sustainable National FAD Programmes, based on the guidelines provided by SPC (Annex 3). Examples of the actions to be implemented include: dedicating existing staff and shore-based facilities to the construction, installation and maintenance of FADs; developing protocols for procurement and storage of FAD materials; allocating suitable vessels for deploying FADs and/or providing incentives for industrial fishing companies to engage in public-private partnerships (PPP) to assist with deployment and maintenance of FADs; establishing/strengthening fishers' associations as vehicles to help deliver all aspects of National FAD Programmes; developing codes of conduct for harmonious use of FADs by multiple stakeholders; modifying the design of FADs to further reduce any potential impacts on marine mammals, turtles and seabirds; and monitoring programmes to determine how to continually improve the effectiveness of FADs [20] (SPC).
 - (ii) Increase the training of small-scale fishers in safe and effective FAD-fishing methods, and provide these fishers with boating safety equipment, so that they can make the transition to fishing further offshore with confidence and safety (SPC).
 - (iii) Ensure that small-scale fishers have access to adequate vessel designs to enable safe and efficient fishing operations further from shore, and to increase the value of the catch, limit waste and reduce GHG emissions (FAO).
 - (iv) Strengthen the capacity of national administrations to manage the risks posed by the increasing effects of climate-driven disasters on small-scale fishers using FADs, by ensuring that the administrations have the tools needed to forecast disasters, assess impacts from disasters, develop recovery plans, and train communities in disaster preparedness and risk mitigation (FAO).
 - (v) Assist cyclone-prone countries to store spare FAD materials (and protect boats needed to deploy FADs) so that communities are well prepared to replace lost FADs and resume fishing for tuna quickly following cyclones, which often devastate land-based food resources (CI, SPC).
 - (vi) Train vulnerable coastal communities in remote locations without refrigeration in simple post-harvest methods (e.g., drying and smoking, home canning) to increase the storage life of tuna caught around FADs and, where appropriate, provide similar training to enterprises processing and distributing tuna offloaded from industrial fishing vessels in regional ports (see Activity A3 below) (SPC).

A2. Develop pathways to minimise climate-driven disruptions to the supply of tuna and bycatch for the food security of urban communities from industrial fishing fleets when they tranship their catches in regional ports. For example, by identifying the most likely hubs for industrial tuna fishing as the climate changes, and cost-effective ways of delivering fish from these hubs to urban communities (FFA and SPC).

A3. Improve the market and supply-chain facilities needed to encourage participation of small and medium enterprises (SME) in distribution of tuna from transhipping operations to urban communities (FFA).

A4. Develop campaigns for coastal and urban communities to raise awareness of the effects of climate change on supply of coral reef fish and the need to consume more tuna for good nutrition. Harmonise these campaigns with stronger regulations on fishing for reef fish and incentives for regional tuna-processing companies to increase the supply of tuna products with greater local appeal, e.g., canned products based on dark tuna meat (SPC and FFA).

SPC has spent many years supporting Pacific Island countries to establish National FAD Programmes and optimise the design and installation of nearshore FADs to increase access to tuna for food security and improve livelihoods of coastal communities (Annex 3). However, as explained in Section B1, there have been barriers preventing the countries participating in this regional programme from fully implementing National FAD Programmes. The baseline

against which the success of the various sub-activities within Activity A1 will be measured includes the past work by SPC and FAO on developing nearshore FAD-fishing in the region, records of the number of nearshore FADs presently deployed in each participating country, consolidation of the small-boat designs currently used in the region, and the nature and accessibility of disaster preparedness and recovery tools (including weather forecasts) presently available for small-scale fishers. Information on tuna consumption from household income and expenditure surveys (HIES) conducted by all countries will provide a collective baseline for Activities A1–A4. SPC has already worked with many Pacific Island countries to modify HIES to include questions that assess the contribution of tuna to household food security.

Component B. Adaptations to reduce risks to Pacific Island economies from climate-driven tuna redistribution

This component of the programme addresses the need to manage the risks to national economies, and the vulnerable populations who depend on public spending, associated with shifting tuna populations by providing reliable information on the extent and timing of climate-driven redistribution of tuna. This will be achieved through the development of an ‘advance warning system’ (AWS) for tuna-dependent economies to predict nearer-term changes in the distribution of tuna across the tropical Pacific Ocean, providing robust forecasts in 1–10-year timeframes, rather than the existing 30–50-year range. The AWS is also expected to allow other Pacific Island countries participating in the programme to identify adaptations to capitalise on projected increased abundances of tuna in their waters with greater confidence.

The specific activities to be implemented in Component B are summarised below (the programme partner/s that will have the main responsibility for executing these activities are shown in brackets).

B1. Design and implement an AWS to assess the effects of climate change on the abundance and distribution of tuna within the EEZs of Pacific Island countries and high-seas areas to inform necessary adaptations for tuna-dependent economies (the AWS will also inform activities A2 and A3 in Component A). Development of the AWS centres around a new paradigm for reducing uncertainty in assessing the likely effects of ocean warming on tuna by establishing tuna ‘resource maps’ based on the distributions of self-replenishing tuna populations (stocks), and modelling the effects of climate change on each tuna stock. The key investments needed to build and operate the AWS are:

- i) Collection of tissue samples from tuna across the Western and Central Pacific Ocean (WCPO) and Eastern Pacific Ocean (EPO), in collaboration with industrial fishing companies, for use in genetic population analyses to identify the stock structure of skipjack, yellowfin, bigeye and albacore tuna (SPC);
- ii) Analysis of genetic samples to produce ‘resource maps’ showing the number and distribution of all stocks comprising each species of tuna within its range in the tropical and subtropical Pacific Ocean (SPC);
- iii) Tuna-tagging programmes to verify the distribution, size and behaviour of all identified tuna stocks (SPC);
- iv) Launching the AWS by integrating the projected effects of climate change on each tuna stock to produce robust assessments of the recommended sustainable catch from the WCPO expected to be caught in the EEZs of Pacific Island countries, and in high-seas areas, on a regular basis in the decades ahead (SPC); and
- v) Collaborations with industrial fishing companies operating in the WCPO to collect data on sea surface temperatures and ocean current velocities to inform and validate global climate models (FFA, SPREP). Acoustic data will also be collected to assess responses of tuna prey to climate change to improve models predicting the responses of tuna species to ocean warming (SPC). These collaborations will identify appropriate protocols for use of these data.

B2. Support Pacific Island countries whose tuna resources are affected by climate change to retain the right to manage the historical levels of tuna catch taken in their waters. This assistance will make use of the AWS to allow the countries to negotiate with confidence within i) WCPFC (the relevant Regional Fisheries Management Organisation), for example, through the process for allocation of fishing rights in high-seas areas under development by WCPFC, and ii) relevant international development forums if required (FFA, CI).

SPC has established a foundation for Activity B1 through its work as the Science Service Provider for WCPFC. This work has resulted in: development of the SEAPODYM model to assess the effects of climate change on the distribution and abundance of tuna; protocols for collecting and storing tuna samples for genetic analysis; methods for tagging tuna to verify the stock structure; and stock assessment models that can be used to develop indicators for climate-driven redistribution of tuna. This experience lays a firm foundation for building an AWS based on identifying the stock structure of the main tuna species and then applying improved versions of the SEAPODYM model to each stock at finer spatial resolution. Annex 6 explains the uncertainties with the existing model and the investments needed to reduce

them to levels where the tuna-dependent countries can use the AWS with confidence to forecast the consequences of tuna redistribution on future government revenue.

National capacity building

National capacity building will be incorporated into all activities in Components A and B. The aims of this investment are to strengthen and sustain 1) institutional and governance arrangements for National FAD Programmes, and for transshipping operations, to increase access to tuna for national food security; 2) understanding of the AWS at the national level and use of information from the AWS to develop the regional solidarity and negotiating skills needed to enable Pacific Island countries to maintain the historical contributions of tuna to their national economies; and 3) use of the AWS to guide other adaptations where appropriate, e.g. adaptations to capitalise on any opportunities arising from redistribution of tuna to subtropical Pacific Island countries.

In terms of rationale, please describe the theory of change and provide information on how it serves to shift the development pathway toward a more low-emissions and/or climate resilient direction, in line with the Fund's goals and objectives.

The basic Goal Statement for the regional tuna programme is given below.

IF:	Pacific Island countries are empowered to implement the <i>Regional Roadmap for Sustainable Pacific Fisheries</i> , and other fisheries management frameworks, in a climate-smart way
THEN:	they will be able to harness the full potential of the region's rich tuna resources for underpinning continued food security and economic development in the face of climate change
BECAUSE:	coastal communities will have the technology and training to increase tuna catches in nearshore waters, urban communities will have continued access to tuna from industrial fleets, and governments will be able to use advanced knowledge of climate-induced changes in tuna migratory patterns to maintain regulatory control of industrial fishing.

The detailed theory of change (Annex 7) for the regional programme is based on i) providing coastal communities with the knowledge, equipment and skills needed to reduce their dependence on declining coral reef fish and make the transition to relying more heavily on tuna for food security; ii) ensuring that the supply of tuna to urban communities from industrial fleets is not disrupted; and iii) building long-term resilience to the impacts of climate change for national economies that would otherwise lack the tools to understand the timing and extent of climate-driven redistribution of tuna and the full effects of this redistribution on their government revenue .

The transition to making tuna a cornerstone of national food systems represents a fundamental change in the development pathway. Under business as usual, the availability of nutritious animal protein (fish) per capita is projected to decline significantly due to the effects of climate change on coral reef fish production, relocation of transshipping operations and population growth, exacerbating malnutrition in some areas, and consumption of low-quality food and the related incidence of non-communicable diseases in other contexts.

Similarly, improved ability to monitor and respond to changes in the distribution of tuna at the regional level with information from the AWS will enable countries to plan to secure the essential economic benefits they receive from the region's most valuable natural resource. In the absence of a reliable information system to forecast the future distribution of tuna, the development of tuna-dependent economies will be increasingly retarded at a time when it is imperative to increase the resilience of vulnerable communities. Specifically, the AWS will provide the evidence that countries and the regional agencies that support them need to pursue the best options for maintaining the rights of Pacific Island nations to the natural resource that underpins their economies.

The theory of change demonstrates how the proposed investments will contribute strongly to two of GCF's four adaptation results areas: 'A1.0 Increased resilience and enhanced livelihoods of the most vulnerable people, communities and regions' and 'A2.0 Increased resilience of health and well-being, and food and water security'. Although not highlighted in Annex 7, a co-benefit of this regional programme is that it is also expected to contribute to

Goal 'A 4.0 Improved resilience of ecosystems and ecosystem services' by reducing the degradation that results from heavy fishing pressure on coral reefs.

Collectively, the proposed activities summarised above are expected to result in four outcomes that are closely aligned to GCF's targeted sustainable outcomes (Annex 7). These outcomes are: 'Strengthened institutions capable of implementing effective adaptations, especially National FAD Programmes, to increase access to tuna (A5.0)'; 'Increased awareness of threats to reef fish supply from climate change and the need to use more tuna for domestic food security (A8.0)'; Increased generation and use of climate information to identify future tuna distribution with confidence (A6.0)'; and 'Strengthened capacity of Pacific Island countries to reduce exposure of their economies to climate-driven tuna redistribution by retaining the present-day benefits received from tuna (A7.0)'

Describe how activities in the proposal are consistent with national regulatory and legal framework, if applicable.

The activities to assist small-scale fisheries adapt to climate change, and to provide growing urban populations with sufficient tuna for good nutrition, will enable the 14 participating countries to achieve the food security goal of the *Regional Roadmap for Sustainable Pacific Fisheries*, and contribute to the *Roadmap's* resilience and livelihood goals.

The activities designed to establish the AWS to inform governments about the most effective ways to adapt their economies to climate-driven redistribution of tuna will assist all tuna-dependent economies to plan to sustain the vital contributions received from tuna. They will also enable the other participating countries to achieve the value and employment goals of the *Roadmap*, and help 10 of the 14 countries achieve the objectives of their NDCs related to adapting to the effects of ocean warming and ocean acidification.

Describe in what way the Accredited Entity(ies) is well placed to undertake the planned activities and what will be the implementation arrangements with the executing entity(ies) and implementing partners.

Conservation International has worked extensively in the Pacific Island region at both the national and regional level for more than two decades. CI has implemented a 'Tuna Initiative' [21] and established strong relationships with the other Executing Entity (SPC) and implementing partners (FFA, FAO and SPREP). For example, CI has led joint publications with SPC, FFA and FAO on the effects of climate change on small-scale and industrial tuna fisheries, and the role that tuna plays in food security across the region [5,8,11,22,23]. In addition, CI and SPC have successfully trialled approaches to strengthen National FAD Programmes with several coastal communities in Vanuatu and Fiji to maintain the supply of fish for food security, with support from the Asian Development Bank (ADB) and the Global Environmental Facility (GEF). CI has also supported Pacific Island countries to implement a *Pacific Oceanscape* programme, which includes substantial efforts to conserve and manage coral reefs and the ocean domain in six of the participating countries [24].

In addition, CI has collaborated with SPC to commission preliminary modelling of the effects of climate change on the four main tuna species in the Pacific Island region, and to plan how best to identify the number of stocks comprising each tuna species [25,26]. This collaboration sets the stage for the AWS activities in Component B needed to model and monitor the future response of each tuna stock to climate change with confidence, and to develop 'climate indicators' to regularly examine whether the modelled shifts in tuna distribution are occurring.

The majority of the activities in Components A and B will be implemented by SPC as the main Executing Entity (Annex 8). However, CI will also act as an Executing Entity to co-ordinate delivery of some activities by the Implementing Partners (FFA, FAO and SPREP) (Annex 8), and assist SPC to implement Activity A1(v) and FFA to implement Activity B2.

In addition to the complexity inherent in assisting 14 countries, CI fully recognizes the challenges of implementing a programme of this size. CI has considerable relevant experience in scaling-up operations in coastal communities and is well placed to assist SPC and participating countries to do this during Component A of the regional tuna programme. For example, CI launched the Bird's Head Seascape initiative in West Papua, Indonesia, in 2014 to protect a 22.5 million ha of seascape at the epicentre of global marine biodiversity. At the outset of this programme, there were virtually no local environmental NGOs operating in the seascape and the local reGENCY governments had only been in place for a few years and had no environmental management capacity. CI served as the lead partner for this initiative, assisted by TNC and WFF. Eventually, over 40 local and international partners were involved. The initial budget of \$350,000 in 2004, increased to \$5–7 million per year from 2008–2017. In 2017, CI led the successful transition to a largely self-sustaining financing model for the seascape, which mobilised government allocations, tourism user-fees, and a dedicated conservation trust fund to cover the majority of the costs required to manage the seascape. In terms of staffing, at the peak of the programme, over 200 (mainly indigenous) staff were employed by the partnership, filling roles from Marine Protected Area (MPA) manager to ranger. CI also strengthened government institutions to take over the key responsibilities for the seascape. MPA staff were then transferred to these institutions, from where they created local environmental NGOs, thereby building the local capacity needed to operate the seascape with reduced International NGO support. In designing the Funding Proposal, CI will draw on the lessons learned during the Bird's Head programme, and from the two GCF projects that CI is implementing as AE.

Please provide a brief overview of the key financial and operational risks and any mitigation measures identified at this stage.

Operating large projects in Pacific Island countries can be challenging due to the limited financial and human resources available to many of the national governments. Also, there are often logistical challenges associated with the remote locations of coastal communities on Pacific Islands. A potential risk is that some of the 14 countries may take time to implement the recommended adaptations to maintain the contributions of small-scale fisheries to food security. However, SPC and FFA were established to help supplement and address limits to the staff capacity of national agencies. FAO and SPREP are also assisting countries to implement adaptations. For example, FAO has recently launched a project to help strengthen some aspects of National FAD Programmes in seven of the participating countries [27]. The widely acknowledged experience of the Accredited Entity, Executing Entities and Implementing Partners in the region is expected to minimise operational risks. Nevertheless, arrangements will be made for all participating countries to work closely with representatives from SPC, FFA, FAO, SPREP and CI to identify and overcome risks to the implementation of the proposed activities, thereby helping to sustain the adaptations after the programme period of performance. This important need for sustainability of interventions will be prioritized during the planning and implementation of all programme activities by including a Steering Committee, comprised of representatives of all 14 participating countries, in the governance arrangements for the programme (Annex 8). The Steering Committee will be supported by a Technical Advisory Group.

The programme will involve substantial grants to SPC as an Executing Entity from the CI-GCF Agency, and smaller grants from Conservation International (as an Executing Entity) to the Implementing Partners (Annex 8). CI has a long history of providing grants to partner organizations and has well-established procedures for managing and monitoring such grants to reduce associated financial risks. In addition, the main Executing Entity (SPC) and Implementing Partners (FFA, FAO and SPREP) have demonstrated capacity to deliver large projects successfully. A thorough assessment of all operational and financial risks, including risk mitigation measures, will be carried out during the design of the Funding Proposal in close consultation with all programme partners and participating countries.

As requested by the GCF, CI is also in the process of planning mitigation actions to operational risks related to the implementation of GCF proposals. CI will report on these plans in a revised version of CI's Entity Work Program to be submitted at the mid-point of the GCF-1 funding cycle. These plans will also be incorporated into the Funding Proposal.

B.3. Expected project results aligned with the GCF investment criteria (max. 3 pages)

The GCF is directed to make a significant and ambitious contribution to the global efforts towards attaining the goals set by the international community to combat climate change, and promoting the paradigm shift towards low-emission and climate-resilient development pathways by limiting or reducing greenhouse gas emissions and adapting to the impacts of climate change. Provide an estimate of the expected impacts aligned with the GCF investment criteria: impact potential, paradigm shift, sustainable development, needs of recipients, country ownership, and efficiency and effectiveness.

The way in which the regional tuna programme performs against the GCF investment criteria is illustrated below, and described in more detail in the following text.



Impact Potential: Adaptations proposed under Component A will have a deep impact on the supply of fish needed for the nutrition and food security of coastal communities within 5 km of the coast in 14 Pacific Island countries (presently

estimated to be >4 million people, and >5 million by 2035). For two of the Least Developed Countries (LDCs) (Kiribati and Tuvalu), and for Cook Islands, Nauru, Niue and Palau, the entire population is expected to benefit from Component A of the programme. Component A will also have co-benefits for livelihoods of coastal and urban communities by creating more opportunities to sell tuna to both rural and urban markets, and for resilience of coral reef ecosystems by reducing fishing pressure. The range of investments described in Component B will prevent potential average losses in fishing access fees of ~\$90 million per year by 2050 for all nine tuna-dependent economies combined due to climate-driven redistribution of tuna.

Paradigm shift: The programme will strengthen/establish two new vehicles for enabling Pacific Island countries to maintain their traditionally high levels of fish consumption under a changing climate – National FAD Programmes to increase access to tuna for coastal communities, and climate-informed systems to deliver tuna to urban communities. These vehicles capitalise on the region's rich tuna resources without threatening the status of tuna stocks and will confer important health benefits to communities – benefits that would otherwise have been seriously diminished due to the effects of climate change on coral reefs, new patterns of industrial fishing, and population growth. The innovations to meet the per capita dietary animal protein requirements of rapidly-growing Pacific Island communities will be complemented by widespread campaigns to raise awareness of the need to rely more heavily on tuna for food security.

Another paradigm shift that will be delivered by this regional programme is the way in which the AWS will i) empower island nations to secure equitable access to tuna resources as climate change alters the distribution of the fish; and ii) provide the foundation for revisions to co-operative fisheries management arrangements within the region needed to match the spatial structure of tuna resources revealed through production of tuna 'resource maps'. The significance of being able to model the effects of climate change on tuna resources with much greater certainty to provide reliable information on changes in the timing and extent of tuna catches in the EEZs of tuna-dependent Pacific Island countries cannot be overstated. The AWS will pave the way for these countries to retain access rights to the natural resource that underpins their economies by strengthening national capacity to negotiate for solutions founded on science and evidence-based decision making. This will facilitate the more transparent, though often difficult, discussions needed to achieve equitable outcomes for a vulnerable region and its populations.

Sustainable development: In the face of escalating damage from ocean warming and acidification to coral reef ecosystems – the habitats that have traditionally provided much of the fish consumed by Pacific Island people – increasing access to tuna is the simplest way to sustain fish consumption by rapidly-growing populations at levels required for good nutrition. The two proposed methods for increasing local access to tuna, scaling-up the use of nearshore FADs through development of National FAD Programmes and fully harnessing the supply of tuna bycatch available from industrial fishing fleets, are well recognised throughout the region as priority developments to sustain fish consumption. Investments in the recommended adaptations will result in FADs becoming part of the national infrastructure for food security, and in climate-informed policies to maximise the availability of tuna bycatch from transshipping operations in regional ports. The imperative for Pacific Island countries to reduce their dependence on imports (further highlighted by the COVID-19 pandemic), the need to combat the high incidence of non-communicable diseases pervading the region with more nutritious diets, and the mandated goal of the *Regional Roadmap for Sustainable Pacific Fisheries* to increase the availability of tuna for domestic consumption, provide assurance that the proposed adaptations will contribute significantly to sustainable development. The opportunities for SME and PPP to engage in these adaptations is also expected to contribute to sustainable outcomes.

In addition, Component A of the programme will contribute to GCF's objective of improving the resilience of ecosystems and ecosystem services. In particular, progressively transferring fishing effort from reef fish to tuna will reduce the impact of overfishing on coral reef ecosystems, thereby improving the resilience of coral reefs to the effects of increasing sea surface temperatures and ocean acidification [28]. Excessive fishing of herbivorous fish associated with coral reefs allows the micro- and macro-algae that compete with corals to proliferate, restricting the ability of corals to re-establish after bleaching events and physical damage from cyclones. Reducing the mortality of herbivorous fish by transferring fishing effort from coral reefs to FADs will help to maintain good populations of these important species and reduce the growth of algae, thereby assisting coral reef ecosystems to use their autonomous adaptive capacity to re-establish following disturbance [Ref 4, Chapters 5 and 9]. During development of the Funding Proposal, the project partners will explore implementable/practical approaches that assist countries to maintain populations of herbivorous reef fish at the levels necessary to support the overarching outcome for 'Productive and healthy ecosystems and fish stocks' under the framework for *A New Song for Coastal Fisheries – Pathways for Change* [18].

The outstanding, sustainable economic development benefit of this programme is that the AWS described in Component B, and the investment in capacity building, will assist the tuna-dependent economies to negotiate for continued, equitable access to tuna resources. This will be achieved by providing these nine countries with the reliable information they need to negotiate the rights to maintain access to the historical catches of tuna made within their waters, regardless of the effects of climate change on distribution of tuna. The information from the AWS will be integrated into the WCPFC framework to i) inform the Conservation and Management Measures developed to align with the Commission's resolution on climate change, and ii) meet the requirement to provide full recognition to the special

requirements of developing States (Article 30 of the Convention for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean). The capacity building component of the programme will also increase skills across the region to negotiate for climate-resilient development pathways for tuna-dependent economies if needed in other high-level forums, informed by relevant international law. As explained in Section C3, the operation of the AWS is expected to be sustained by WCPFC as one of the prime tools needed to manage the tuna resources of the region as the climate continues to change.

The 'resource maps' produced during development of the AWS will provide WCPFC with an improved knowledge base for using harvest strategies to sustain tuna harvests from the WCPO as ocean warming continues. Given that 60% of the world's tuna comes from the WCPO, and tuna dominate the biomass of larger fish species in the ecosystem, this programme will also make an important contribution to *Sustainable Development Goal 14* (Conserve and sustainably use the oceans, seas and marine resources for sustainable development).

Further details about the contribution of this programme to sustainable development across the Pacific Island region are given in Annex 5.

Needs of recipients: The programme is expected to have a profound effect on the food security of coastal and urban Pacific Island communities, and the economic development of nine Pacific Island countries. Adaptations for small-scale fisheries, and better use of tuna bycatch from industrial fisheries, will help ensure that tuna contributes the necessary 25% of recommended fish consumption across the region needed for food security and improved nutrition/public health by 2035 [8]. Expanding the use of nearshore FADs will increase the tuna catches of small-scale fishers, and the advent of new designs for small vessels will improve safety-at-sea, add value to the catch, and reduce operating costs and GHG emissions. New methods for disseminating forecasts for sea conditions will meet the information needs of small-scale fishers, enabling them to operate with much greater safety.

The AWS will provide tuna-dependent Pacific Island countries with much more reliable information about the potential losses of government revenue and employment opportunities from redistribution of tuna, and help identify the most appropriate ways to retain their rights to manage the tuna resources that presently occur within their combined EEZs. This will be essential for achieving the tuna-related goals of the *Regional Roadmap for Sustainable Pacific Fisheries*.

The proposed activities will also help meet the needs of women in the fisheries sector. National FAD Programmes, which include development of methods for catching a range of pelagic fish species in nearshore waters, are expected to provide increased opportunities for women because they already catch limited quantities of small pelagic fish in the sheltered nearshore waters of some countries. Training in post-harvest methods for tuna caught by small-scale fishers will also be of direct benefit to women, who have traditionally taken responsibility for increasing the shelf life of fish products. In addition, the plans to improve the distribution of tuna offloaded during transshipping operations in regional ports, and local supply chains for tuna, are very likely to increase livelihood opportunities for women because they are already engaged in these activities, e.g., in Solomon Islands. Taken together, the outcomes of all activities in Component A are expected to increase the availability of nutritious food for households and increase the safety of family members fishing at sea. By ensuring the continued supply of tuna, the AWS is also expected to help maintain employment for women in tuna canneries across the region, where they make up the majority of the workforce.

The Funding Proposal will use a three-pronged approach to gender mainstreaming. First, desk research, focus groups and expert interviews will be used to examine women's roles, responsibilities and access to marine resources in Pacific Island countries, focusing on coastal communities where FADs improve access to tuna and urban communities using bycatch for food security. Second, the specific barriers women face in accessing marine resources, jobs and other benefits associated with tuna, and the opportunities to improve women's access to and control over the benefits, will be identified and characterised. Third, a set of recommended actions that national administrations can implement to minimize the barriers women face and maximize opportunities will be developed. Furthermore, a series of strategic data gathering and monitoring techniques will be used to further illuminate the ways in which women participate in fishing around FADs, engage in post-harvest activities associated with fish caught around FADs and offloaded during transshipping operations, and derive benefits from tuna for themselves and their families.

Country ownership: A pre-concept for this regional programme was presented at the 10th SPC 'Heads of Fisheries' meeting in 2017. Letters of support for the pre-concept were received from Cook Islands, Fiji, Nauru, Papua New Guinea, Solomon Islands and Vanuatu. A draft Concept Note was then presented at the 11th SPC Heads of Fisheries meeting, and to NDAs at their meeting in Samoa, in March 2019. The eight countries initially selected to participate in the programme were then asked to provide feedback on the draft Concept Note. The Heads of Fisheries and/or NDAs from all these countries responded to this request and provided letters of support. Based on the need to deliver benefits to all 14 Pacific Island countries eligible for support from GCF, the additional six countries were also consulted in late 2019 about their needs to maintain the contributions that tuna makes to their communities and economies, and their interest in joining this regional programme. The proposed revisions to the Concept Note were presented to all 14 countries participating in the 12th SPC Heads of Fisheries meeting in May 2020. Feedback from that meeting, and from

some NDAs, was used to finalise the Concept Note to ensure that it represents the needs of the region. Letters of support for the revised Concept Note have been received from the Heads of Fisheries agencies/NDAs 13 of the 14 participating countries in 2020 (see Annex 9). By April 2021, the NDAs from 10 of the participating countries had provided letter of support for the revised Concept Note. Marshall Islands has not yet confirmed their participation in the proposed regional programme. However, the Executive Director of the Marshall Islands Marine Resources Authority noted in our most recent communications that he had not had the opportunity to consider the proposal fully but considered climate change to be a significant risk to their ongoing interests in tuna fisheries.

Efficiency and effectiveness: The activities proposed in this regional programme represent a highly efficient way of building the resilience of 14 Pacific Island countries with an extraordinary dependence on tuna for food security and/or economic development. The activities described in Component A (approximately 54% of the requested grant budget for operating activities) will increase access to nutritious animal protein for up to 5 million people living within 5 km of the coast from all participating countries by 2035. The estimated cost of this benefit is \$7 per person over a seven-year period, i.e., \$1 per person per year. In addition, the proposed mechanisms for sustaining National FAD Programmes for coastal communities, and distribution of tuna from transshipping operations for urban communities, will ensure that the food security benefits of this investment will continue well beyond the life of the programme.

The activities in Component B (approximately 46% of the requested grant budget for activities) will empower nine countries to prevent estimated combined losses of government revenue of \$90 million (range \$40–\$140 million) per year at today's value by 2050. These estimates will be adjusted as uncertainty in the tuna modelling is reduced through development of the AWS. Even so, the benefits for tuna-dependent economies are expected to exceed the total grant request of ~\$30 million for Component B within a relatively low number of years, and are likely to exceed the total grant request for Component B each year within 10–20 years of completion of the programme.

A measure of the relative cost effectiveness of this regional programme is that the total cost equates to average expenditure of \$5 million per participating country over seven years.

The regional programme is also a sound investment because it will not only build the resilience of tuna-dependent communities and economies in 14 countries, it will also strengthen the capacity of SPC as the Science Service Provider to WCPFC, and to the other regional fisheries management agencies (FFA, PNA).

Other efficiencies include Component A's complementarity with the GCF programme currently under development as a Funding Proposal, entitled 'Melanesia - Coastal and Marine Ecosystem Resilience Programme' led by IUCN. M-CMERP will minimise the gap in supply of coastal fish by building the resilience of the coastal habitats underpinning coastal fish production, while Component A will fill the gap in fish supply by increasing access to tuna (Annex 10). There are also strong synergies between Component B and the Funding Proposal under consideration by GCF entitled 'Enhancing Climate Information and Knowledge Services for Resilience in 5 Island Countries of the Pacific Ocean' led by UNEP. For example, the enhanced meteorological forecasting proposed by UNEP links to Activity A1, and improvement in collection of meteorological data for some EEZs in the UNEP proposal will also help improve tuna and global climate models in line with Activity B1 v).

The information above provides a general indication of the GCF Performance Measurement Framework impact indicators relevant to the programme. Detailed performance impact indicators will be presented in the Funding Proposal.

B.4. Engagement among the NDA, AE, and/or other relevant stakeholders in the country (max ½ page)

Please describe how engagement among the NDA, AE and/or other relevant stakeholders in the country has taken place and what further engagement will be undertaken as the concept is developed into a funding proposal.

As described in Section B3, there has been extensive engagement with national fisheries agencies and NDAs by Conservation International, SPC and the other programme partners to develop the Concept Note. In addition to the information presented to participating countries during the SPC Heads of Fisheries meetings, other extensive information exchanges have been made with several NDAs and Heads of Fisheries to provide further details of the various activities to be implemented in Components A and B of the programme. A summary of the engagement with participating countries during development of the Concept Note is provided in Annex 11. Development of the Funding Proposal will be based on comprehensive consultations between the NDA and national fisheries agency in each of the 14 participating countries and the Accredited Entity, Executing Entity and Implementing Partners. Note, however, that all activities in Component A will not be implemented in all 14 countries – cyclone-proofing of FAD infrastructure (Activity A1 v), new vessel designs (A1 iii) and development of adaptations and supporting policies for increasing access to tuna for urban populations (A2 and A3), are examples of activities to be done in appropriate sub-sets of countries. The AWS activities (Component B) will be planned by SPC, FFA, SPREP and the Accredited Entity in consultation with all Pacific Island countries. Preliminary discussions have also been held with industrial tuna-fishing companies to identify how they can best assist the programme to collect: i) data on sea surface temperature and ocean currents to help improve global climate models; and ii) acoustic data on the food web supporting tuna to improve understanding about the effects of

climate change on the broader ecosystem to further reduce uncertainty in the models used to assess the response of tuna stocks to climate change. Further collaboration with the private sector, particularly industrial fishing companies, will be identified and developed during preparation of the Funding Proposal.

C. Indicative Financing/Cost Information (max. 3 pages)

C.1. Financing by components (max ½ page)

Please provide an estimate of the total cost per component/output and disaggregate by source of financing

Component/Output	Indicative cost (USD)	GCF financing		Co-financing		
		Amount (USD)	Financial Instrument	Amount (USD)	Financial Instrument	Name of Institutions
Component A. Adaptations to harness tuna for food security as coral reefs are degraded by climate change						
A1 i). Strengthen National FAD Programmes	16,100,000	16,100,000	Grant			
A1 ii). Training small-scale (SS) fishers in safe and effective FAD fishing	4,000,000	4,000,000	Grant			
A1 iii). New boat designs for SS fishers	2,050,000	2,050,000	Grant			
A1 iv). Strengthen management of natural disaster risks for SS fishers	1,500,000	1,500,000	Grant			
A1 v). Equipment support, cyclone-prone countries	1,500,000	1,500,000	Grant			
A1 vi). Training communities in post-harvest methods	2,000,000	2,000,000	Grant			
A2. Pathways to strengthen supply of tuna for urban communities	1,000,000	1,000,000	Grant			
A3. Improve market and supply chain facilities	3,500,000	3,500,000	Grant			
A4. Climate change and nutrition awareness campaigns for communities	1,500,000	1,500,000	Grant			
Capacity building ¹	2,200,000	2,200,000	Grant			
Subtotal Component A	35,350,000	35,350,000				
Component B. Adaptations to reduce risks to Pacific Island economies from climate-driven tuna redistribution						
B1 i). Collection of tuna samples for population analysis	43,000,000	2,100,000	Grant	40,000,000	In kind	Fishing industry ²
				900,000	Grant	SPC ³
B1 ii). Analysis of tuna stock structure to produce 'resource maps'	10,250,000	10,250,000	Grant			
B1 iii). Verification of stock structure with tuna tagging	9,250,000	4,850,000	Grant	4,400,000	Grant	SPC
B1 iv). Launch & operation of advanced warning system	5,750,000	4,750,000	Grant	1,000,000	Grant	SPC
B1 v). Data collection by industrial fishing fleets	5,500,000	2,100,000	Grant	3,400,000	Grant	SPREP ³
B2. Maintaining rights of countries to tuna resources	1,500,000	1,500,000	Grant			
Capacity building ¹	5,500,000	4,500,000	Grant	1,000,000	Grant	SPC
Subtotal Component B	80,750,000	30,050,000		50,700,000		

M&E Costs	1,500,000	1,500,000	Grant			
Project Management Costs	3,345,000	3,345,000				
Indicative total cost (USD)	120,945,000	70,245,000			50,700,000	

Budget Notes:

¹See Section B.2 for a summary of the capacity-building to be undertaken for Components A and B. During development of the Funding Proposal, capacity building will be integrated into the budgets for activities.

²Industrial fishing fleets will be used to collect tuna tissue samples across the vast expanse of the tropical Pacific Ocean over a period of three years for use in the analysis of stock structure. If vessels had to be chartered for this purpose, the estimated cost would be approximately USD 40 million. The 'in kind' co-finance represents the charter cost of operating the vessels during the time taken to collect the samples. In-kind contributions from industrial fishing fleets are also expected for Activity B1 v) but will be quantified during preparation of the Funding Proposal.

³The 'grant' co-finance to be contributed by SPC and SPREP represents funding that these organisations expect to receive during the project period that will be spent directly on the B1 activities.

C.2. Justification of GCF funding request (max. 1 page)

Explain why the Project/ Programme requires GCF funding, i.e. explaining why this is not financed by the public and/ or private sector(s) of the country.

Pacific Island countries collectively contribute <0.003% of global GHG emissions each year but are recognised as the nations most vulnerable to climate change, not only to sea-level rise but also to the effects of climate impacts on coral reefs and redistribution of tuna. GCF grant funding is essential for enabling Pacific Island countries to adapt due to the limited financial resources of their national governments.

Although nine of the countries participating in the programme receive an average of 32% (range = 4–70%) of their total annual government revenue (excluding grants) from tuna-fishing access fees, the demands on this funding to support basic government services is intense, leaving insufficient funds to invest in identifying how best to adapt to the effects of climate change on the fish resources that sustain communities and national economies, particularly coral reef fisheries and the rich tuna resources of the region.

Regarding the commercial fleets that pay licensing fees to the governments, these fleets will only be affected by climate change to a minor extent because they have the ability to follow the fish to international waters as climate change occurs. The negative impact of climate change is therefore on the Pacific Island nations and not the fleets. There is little or no scope for the tuna-fishing industry to contribute to the costs of the proposed activities, except through in-kind contributions of vessel time to assist with the deployment of FADs to increase access to tuna for local food security, and to participate in the comprehensive sampling needed to develop the AWS.

As regional fisheries organisations serving Pacific Island countries, SPC and FFA receive financial contributions from their members to assist them to manage the region's shared tuna resources. SPC also receives financial support from WCPFC as the 'Science Services Provider and Data Manager' for the Commission. However, these funding streams presently only enable SPC and FFA to monitor tuna catches, conduct regular stock assessments, and provide scientific and management advice. Both organisations depend on grant funding to engage in advising Pacific Island countries about how best to adapt to climate change, and to assist countries to implement priority adaptations. None of SPC's and FFA's normal development partners are in a position to make the scale of investments needed to assist Pacific Island countries, including the three LDCs, adapt at scale to maintain the significant food security and economic benefits they receive from tuna, their most valuable natural resource commodity, as the climate changes.

Describe alternative funding options for the same activities being proposed in the Concept Note, including an analysis of the barriers for the potential beneficiaries to access to finance and the constraints of public and private sources of funding.

As mentioned above, it is important to note that although the private sector (industrial fishing companies) will be playing a significant role in the programme, they are not the main beneficiaries, and will not be in a position to pay the direct costs of specific programme activities. Instead, the programme will capitalize on the regular operations of industrial fishing fleets to cover the considerable costs of data collection across the vast domain of the tropical/subtropical Pacific Ocean – costs that would otherwise need to be funded through the GCF grant. A prime example is the way in which industry is expected to collaborate in the collection of the tens of thousands of tuna tissue samples needed to identify tuna stock structure [Activity B1 (i)] over a period of three years across an area of 28 million km². As mentioned above, if the programme needed to charter vessels to collect these samples, the estimated cost would be \$40 million USD.

GEF International Waters could be interested in funding some aspects of this programme, and other donors may want to invest in specific activities. However, many of the investments needed to develop the AWS to ensure that the *Regional Roadmap for Sustainable Pacific Fisheries* and *New Song for Coastal Fisheries* are not disrupted by climate change need to be made sequentially. It is extremely unlikely that the necessary funding could be raised from an ensemble of donors in the co-ordinated way needed to do the work efficiently. A unified approach, supported by a single funding vehicle is required, not a piecemeal approach. Nevertheless, earnest efforts will be made to identify additional co-finance during development of the Funding Proposal where possibilities exist for other organisations to contribute to the costs of specific activities.

It should be noted that the 'Pacific EU Marine Partnership Project' is funding several of the activities needed to develop and sustain fisheries in the region. However, little of this project's funding is directed towards assisting tuna-dependent communities and economies in the region to adapt to climate change.

Justify the rationale and level of concessionality of the GCF financial instrument(s) as well as how this will be passed on to the end-users and beneficiaries. Justify why this is the minimum required to make the investment viable and most efficient considering the incremental cost or risk premium of the Project/ Programme (refer to Decisions B.12/17; B.10/03; and B.09/04 for more details). The justification for grants and reimbursable grants is mandatory.

Grant financing is justified for this programme because of the acute vulnerability to climate change of Pacific Island countries and their populations, including three LDCs, and the limited financial assets of these countries. Many Pacific Island countries have a very small tax base and prioritise allocation of government revenue, including the substantial proportion derived from tuna-fishing licence fees, to meet their nation's basic needs, particularly health and education. The overwhelming necessity to meet such needs makes it difficult to invest in adaptations required to reduce the risks to the economic benefits derived from tuna as the climate changes.

The budget for the Funding Proposal will be developed in a way that builds on other initiatives to support sustainable management of the region's small-scale and industrial tuna fisheries, and will target the incremental costs of adapting tuna-dependent communities and economies to climate change. Grant finance will allow communities that benefit from increased food security through the proposed activities to build their resilience without incurring more national debt. The substantial investment involved in developing an AWS for tuna-dependent economies that reduces the high levels of uncertainty still associated with the preliminary modelling used to estimate the likely impacts of climate change on the natural resource that underpins 4-70% of all (non-aid) government revenue for nine Pacific Island countries is justified because it will: i) enable these countries to identify adaptations that reduce risks to their economies with confidence, and ii) provide them with improved information to continue to manage tuna resources co-operatively. The AWS will empower these vulnerable countries to negotiate as a bloc to retain the rights to the levels of tuna catch traditionally made within their EEZs, regardless of climate-driven tuna redistribution. An example of an adaptation that could be informed by the AWS is the development of new transshipping facilities in Pacific Island countries where the information system predicts with considerable confidence that the abundance of tuna is expected to increase to levels that will support substantial industrial fishing activity.

Although the most likely way to fund the regional programme will be through a grant, for the reasons outlined above, during development of the Funding Proposal, the project partners will commission a thorough assessment of possible revenue-generating opportunities stemming from the investments made by GCF, and an assessment of alternatives to an all-grant financial structure if warranted.

C3. Sustainability and replicability of the project (exit strategy) (max. 1 page)

Please explain how the project/programme sustainability will be ensured in the long run and how this will be monitored, after the project/programme is implemented with support from the GCF and other sources.

During development of the Funding Proposal, the programme partners will work with all participating countries to identify the most practical mechanisms and supporting policies to sustain and harmonise National FAD Programmes, and systems for increasing access to tuna from transshipping operations, in the long term. Such mechanisms and supporting policies are likely to vary among countries depending on the national context but are expected to fall into the following broad categories.

1. Actions to sustain increased use of tuna for improved nutrition of Pacific Island people, and provide the co-benefit of income-earning opportunities for vulnerable local communities, beyond the life of the programme.
 - Classifying FADs as part of the permanent national infrastructure of food security, and incorporating National FAD Programmes within ongoing national development plans and recurring budgets.
 - Continuing the food security goals of the *Regional Roadmap for Sustainable Pacific Fisheries* in further 10-year cycles.

- Promoting models for community/industry engagement and ownership of FADs, e.g., fisher association-based fees to contribute to FAD maintenance; and PPP between commercial fishing companies and governments to provide assistance with FAD deployment, maintenance and emergency response, as part of company Corporate Social Responsibility programmes.
- Creating legislation to prosecute actions that destroy or damage FADs, or violate community-based FAD rules.
- Promoting transfer of fishing effort from coral reefs to tuna, and strengthening regulations for reef fisheries (especially herbivorous fish species) to maximise long-term sustainable production from degrading coral reefs (see 'Sustainable development' in Section B3).
- Providing long-term incentives for SME and PPP to distribute tuna from transshipping operations to urban communities, and process surplus bycatch for export to neighbouring countries with shortages in fish supply. For example, by assisting SME and PPP to access 'Performance-based climate resilience grants' administered by United Nations Capital Development Fund (UNCDF).
- Including the importance of tuna consumption for improved nutrition in national programmes to combat non-communicable diseases.

2. Policies to directly increase access to tuna for domestic consumption.

- Mandating retention and landing of all bycatch from purse-seine vessels in regional ports, supported by permanent regulations banning discarding of low-value species at sea, monitored through regional observer programs.
- Revising tuna-fishing licence conditions to ensure that locally-based industrial fishing fleets supply domestic markets with tuna where there is insufficient bycatch to meet demand.

The success of measures to sustain increased access to tuna will be evaluated using HIES surveys (see Component A in Section B2).

The existing institutional arrangements in place in the region provide a strong framework for sustaining the operation of the AWS, and the adaptations informed by the AWS, after the conclusion of the programme. The key features of these institutional arrangements centre around the WCPFC, which has the mandate to manage tuna stocks in the WCPO, and the roles that SPC plays as the Science Services Provider to WCPFC, and that FFA and PNA fulfil as regional fisheries management agencies. Once the AWS has been established, it is expected to support WCPFC's climate change resolution (Annex 4) and serve a core area of the Commission's future work. Consequently, the resources needed by SPC to operate the AWS as the science provider are expected to be supported by WCPFC and its membership [29]. Nevertheless, during development of the Funding Proposal, other possible sources of funding to operate the AWS in the long term, such as national sovereign wealth funds or savings schemes for climate adaptations, will be explored. Governments are expected to benefit significantly from the AWS and associated Component B activities, and will be encouraged to consider contributing to the ongoing operational costs for the AWS in such ways.

Industrial fishing companies are expected to have a vested interest in sustaining the collection of data described in Activity B1 (v) to inform the AWS in the long-term. Therefore, the cost/benefit for industry will be analysed during development of the Funding Proposal, and the potential for obtaining matching funding from industry for continued operation of components of the AWS will be assessed. Once data collection methods have been standardised, countries participating in the programme will also be encouraged to consider the benefits of implementing licence conditions mandating regular collection of the data required for efficient operation of the AWS by industrial fishing fleets.

Two important features of fisheries management in the region are also expected to sustain the operation of the AWS. The first is the solidarity of the PNA. These eight countries have a strong collective interest in understanding the extent and timing of climate-driven tuna redistribution for the reasons described under 'Sustainable development' in Section B1. The second is the need for WCPFC to understand whether any of the tuna resources presently under its jurisdiction are eventually likely to occur to a greater extent in the Eastern Pacific Ocean convention area managed by the Inter-American Tropical Tuna Commission. Such redistribution of tuna will necessitate increased collaboration between these two regional fisheries management organisations.

The requested investments in capacity building are also expected to sustain the key interventions to be informed by the AWS, i.e., negotiations by tuna-dependent Pacific Island countries to maintain the rights to the historical levels of tuna catch made within their EEZs. Negotiators trained during the programme should be well positioned to pursue the needs of the region in international forums until such time as an equitable solution is made permanent.

Further details about mechanisms to sustain the programme activities are provided in Annex 5.

D. Supporting documents submitted (OPTIONAL)

- Vulnerability of Pacific Island communities and economies to climate change (Annex 1)
- Map indicating the location of the project/programme (Annex 2)
- SPC Policy Brief 31 'Sustainable National FAD Programmes (Annex 3)
- Western and Central Pacific Fisheries Commission Climate Change Resolution (Annex 4)
- Consultancy Report: Identifying options to ensure sustainability of the outcomes from the proposed regional tuna programme for the Green Climate Fund (Annex 5)
- Improvements needed to reduce uncertainty associated with preliminary tuna modelling (Annex 6)
- Theory of change (Annex 7)
- Proposed governance and administrative arrangements (Annex 8)
- Letters of support from participating countries (Annex 9)
- Complementary nature of Component A activities and the IUCN proposal 'Melanesia - Coastal and Marine Ecosystem Resilience Programme' (Annex 10)
- Summary of engagement with participating countries to develop the original Concept Note in 2018/ 2019, and the revised Concept Note (Annex 11)
- List of acronyms used in the Concept Note (Annex 12)

Self-awareness check boxes

Are you aware that the full Funding Proposal and Annexes will require these documents? Yes No

- Feasibility Study
- Environmental and social impact assessment or environmental and social management framework
- Stakeholder consultations at national and project level implementation including with indigenous people if relevant
- Gender assessment and action plan
- Operations and maintenance plan if relevant
- Loan or grant operation manual as appropriate
- Co-financing commitment letters

Are you aware that a funding proposal from an accredited entity without a signed AMA will be reviewed but not sent to the Board for consideration? Yes No

References and notes

1. IPCC, 2014: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Barros, V.R., C.B. Field, D.J. Dokken, M.D. Mastrandrea, K.J. Mach, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y .O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P .R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 688.
https://www.ipcc.ch/site/assets/uploads/2018/02/WGIIAR5-PartB_FINAL.pdf
2. IPCC, 2018: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)] https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_Low_Res.pdf

3. IPCC, 2019: IPCC Special Report on the Ocean and Cryosphere in a Changing Climate [H.-O. Pörtner, D.C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck, A. Alegría, M. Nicolai, A. Okem, J. Petzold, B. Rama, N.M. Weyer (eds.)] https://www.ipcc.ch/site/assets/uploads/sites/3/2019/12/SROCC_FullReport_FINAL.pdf
4. Bell, J.D., Johnson, J.E. and Hobday, A.H. 2011. Vulnerability of tropical Pacific fisheries and aquaculture to climate change. Secretary of the Pacific Community, Noumea, 927 pp. <https://www.spc.int/cces/climate-book/spc-publications-on-climate-change#tab-682-2>
5. Barange, M., Bahri, T., Beveridge, M.C.M., Cochrane, K.L., Funge-Smith, S. and Poulain, F. 2018. Impacts of climate change on fisheries and aquaculture Synthesis of current knowledge, adaptation and mitigation options. FAO Fisheries and Aquaculture Technical Paper 627, Rome. <http://www.fao.org/3/i9705en/i9705en.pdf>
6. Based on the most recent, but as yet unpublished, modelling and economic analyses by the project partners. These analyses update the information in SPC Policy Brief 32 (reference 11).
7. SPC 2008. Fish and Food Security. SPC Policy Brief 1/2008. <https://pacificdata.org/data/dataset/oai-www-spc-int-ced24e95-7e0a-401a-9f0b-d79316c49cb0>
8. Bell J.D. et al. 2015. Diversifying the use of tuna for food security and public health in Pacific Island countries and territories. *Marine Policy* 51:584-591. <http://dx.doi.org/10.1016/j.marpol.2014.10.005>
9. Brouwer et al. 2019. The Western and Central Pacific tuna fishery: 2018 overview and status of stocks. SPC Tuna Fisheries Assessment Report 19. <https://oceanfish.spc.int/en/ofpsection/sam/508-tuna-fisheries-assessment-report-no-19>
10. Aqorau, T. et al. 2018. Good governance for migratory species. *Science* 361 (6408): 1208-1209, see also <https://atlasofscience.org/good-governance-for-migratory-fish-stocks/>
11. SPC 2019. Implications of climate-driven distribution of tuna on Pacific Island economies. SPC Policy Brief 32/2019. https://www.spc.int/DigitalLibrary/Doc/FAME/Brochures/Anon_19_PolicyBrief32_TunaClimate.html
12. Lam, V.W.Y. et al. 2020. Climate change, tropical fisheries and prospects for sustainable development. *Nature Reviews: Earth and Environment* <https://doi.org/10.1038/s43017-020-0071-9>
13. Pacific Islands Forum Fisheries Agency, fisheries development data for the 4-year period 2015-2018.
14. Senina, I. et al. 2018. Impact of climate change on tropical Pacific tuna and their fisheries in Pacific Islands waters and high seas areas. Western and Central Pacific Fisheries Commission 14th Scientific Committee, Working Paper SC14-EB-WP-01 <https://www.wcpfc.int/node/30981>
15. https://pacificclimatechange.net/document/frdp_2016
16. <https://www.wcpfc.int/doc/resolution-2008-01/resolution-aspirations-small-island-developing-states-and-territories>
17. https://ffa.int/system/files/Roadmap_web_0.pdf
18. https://www.spc.int/DigitalLibrary/Doc/FAME/Reports/Anon_2015_New_song_for_coastal_fisheries.html
19. Gallo, N. et al. 2017. Ocean commitments under the Paris Agreement. *Nature Climate Change* [10.1038/nclimate3422](https://doi.org/10.1038/nclimate3422)
20. Anon. 2019. Establishing a national FAD programme. *SPC Fisheries Newsletter* 160, 24-26.
21. <https://www.conservation.org/projects/Pages/Sustaining-Pacific-Island-fisheries.aspx>
22. Bell, J.D. et al. 2015. Optimising the use of nearshore fish aggregating devices for food security in the Pacific Islands. *Marine Policy* 56,98-105. <http://dx.doi.org/10.1016/j.marpol.2015.02.010>
23. Bell, J.D. et al. 2018. Adaptations to maintain the contributions of small-scale fisheries to food security in the Pacific Islands. 88, *Marine Policy* 303-314. <http://dx.doi.org/10.1016/j.marpol.2017.05.019>
24. <https://www.conservation.org/where/Pages/pacific-oceanscape.aspx>

25. Moore, B.R. et al. 2020. Defining the stock structures of key commercial tunas in the Pacific Ocean I: Current knowledge and main uncertainties. *Fisheries Research* <https://doi.org/10.1016/j.fishres.2020.105525>
26. Moore, B.R. et al. 2020. Defining the stock structures of key commercial tunas in the Pacific Ocean II: Sampling considerations and future directions. *Fisheries Research* <https://doi.org/10.1016/j.fishres.2020.105524>
27. <http://www.fao.org/asiapacific/news/detail-events/en/c/1181704/>
28. Van Hooijdonk, R. et al. 2016. Local-scale projections of coral reef futures and implications of the Paris Agreement, *Scientific Reports* <https://www.nature.com/articles/srep39666>
29. The annual budget of the WCPFC in 2019 was just over 8 million USD. <https://www.wcpfc.int/node/32610>